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JOURNAL

OF THE

MASSACHUSETTS ASSOCIATION

OF

BOARDS OF HEALTH

An Official Quarterly Record of
Information for the Public

MARCH, 1898

Proceedings of the January Annual Meeting

Subject: Rules Suggested for Adoption by Boards of Health for the Protection of Milk Supplies from Pollution — Experiments with Formaldehyde Gas as a Disinfectant

BOSTON
SMALL, MAYNARD & COMPANY
6 Beacon Street

VOLUME VIII NUMBER 1

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JOURNAL OF THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH

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JOURNAL OF THE

MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

ORGANIZED 1890.

[The Association as a body is not responsible for statements or opinions of any of its members.]

VOL. VIII. March, 1898. No. 1

JANUARY MEETING

OF THE

Massachusetts Association of Boards of Health.

The January (annual) meeting of the Massachusetts Association of Boards of Health was held at the Parker House, Boston, on the afternoon of Thursday, Jan. 27, 1898. The President, Dr. H. P. Walcott, was in the chair. The proceedings were as follows: —

THE PRESIDENT.— Will the Association come to order, and listen to the reading of the record of the last meeting?

The record was read by the Secretary.

THE PRESIDENT.— Is it your pleasure to accept the record as read to you? If so, it will stand as the record of the last meeting of this Association. The next business in order is the election of your officers. How shall we proceed thereon?

DR. E. A. SAWYER.— Mr. President, I move that a committee of three be appointed by the chair to bring in a list of officers for the ensuing year.

The motion was accepted and adopted.

THE PRESIDENT.— I will appoint as that committee Dr. Sawyer of Gardner, Mr. Pilsbury of Boston, and Mr. Newcomb of Salem. Will they please retire, and make up their list of nominations? While your committee is engaged in this business, will the Executive Committee please meet at this end of the room, in order that we may consider a few items of business that are now on hand? I would also ask if any member of this Association has any additional names which he wishes to present for membership in the Association. If so, I should be glad to have them submitted at once to the Executive Committee.

A brief intermission here ensued.

THE PRESIDENT.— Will the Association come to order, and listen to the reading of the report of the Treasurer, Dr. Field?

The Treasurer's report for the year 1897 was then read by the Treasurer.

TREASURER'S ANNUAL REPORT, 1897.

RECEIPTS.

Balance from 1896	$605.19
Annual assessments	206.50
Total	$811.69

EXPENSES.

Reporting meetings	$141.65
Postage	45.01
Printing	26.80
Cigars and dinner for guests	22.50
Clerical assistance	2.00
Total expenses	$237.96
Balance to 1898	573.73
Total	$811.69

$500 of the balance is in the savings-bank, drawing interest.

Respectfully submitted,

JAMES B. FIELD, *Treasurer.*

Examined and approved as correctly cast and properly vouched for.

J. ARTHUR GAGE, *Auditor.*

THE PRESIDENT.— You have heard the report of your Treasurer. Shall it be received and placed on file? If there be no objection, it will be so received and placed on file. The Executive Committee desires to report to the Association the names of the following gentlemen as proper candidates for election to membership in the Association: —

CHARLES HARRINGTON, M.D.	Boston.
GEORGE M. WHITAKER	Boston.
C. H. HOOD	Boston.
FRED H. SCHAAKE, M.D.	Lawrence.
GEORGE W. SMITH	Lawrence.
H. A. SIBLEY, M.D.	Chelsea.
FRANCIS G. CURTIS, M.D.	West Newton.
E. R. UTLEY, M.D.	Newton.
ROBERT BURNS	Somerville.
GEORGE WHITING	Somerville.
DAVID M. LITTLE	Salem.
GEORGE G. HATHAWAY	Salem.
GEORGE W. MCINTIRE	Salem.
GEORGE A. NEWHALL	Salem.
JOHN K. WHITING	Brookline.

Is it your pleasure that these gentlemen be elected to membership in this Association? If so, you will please signify it by saying ay. [The vote was taken, and the President declared the above-named gentlemen unanimously elected.] Will you now listen to the report of your Committee upon Nominations?

DR. SAWYER.— Mr. President, the Committee appointed to bring in the list of officers for the ensuing year have attended to their duty, and would report as follows: —

OFFICERS, 1898.

H. P. WOLCOTT, M.D., *President.*

S. H. DURGIN, M.D., *1st Vice-Pres.* S. W. ABBOTT, M.D., *2d Vice-Pres.*

E. FARNHAM, M.D., *Secretary.*

J. B. FIELD, M.D., *Treasurer.*

Executive Committee.

W. P. BOWERS, M.D. W. Y. FOX, M.D. G. L. TOBEY, M.D.

N. HATHAWAY. W. H. GOVE.

THE PRESIDENT.— You have heard the report of your committee. What action will you take thereon?

It was moved that the report be accepted and adopted.

It was moved and seconded that the further consideration of the Amendments to the Constitution be deferred to the next meeting. The motion was adopted.

The President.— The Executive Committee would further report that the matter brought to their attention at the last meeting by Mr. Brimblecom be referred to the Committee on Legislation. Is it your pleasure that the recommendation of the Executive Committee be agreed to? If so, you will signify it by saying ay.

It was voted that the matter be thus referred.

The President.— What action will you take, gentlemen, upon this list of officers? [It was moved and seconded that the list be accepted, and the vote was taken.] The gentlemen named on this list have been unanimously elected, and are the officers for the ensuing year.

I beg leave to thank you, gentlemen, for the honor which I have already enjoyed at your hands, I think, too often. I should be very glad, indeed, to be retired from this place, and allow any one of the many other gentlemen who would represent you, I am afraid, more ably than I can, to take my place. The next business upon your programme is the Further Report on Protection of Milk Supplies. I will call upon Professor Sedgwick.

Professor W. T. Sedgwick.— Mr. President and gentlemen of the Association and our distinguished guests, you are all aware that this Association has been for some time trying to formulate a set of rules which would look to the betterment of the milk supply of our larger cities and towns. As is often the case, when people undertake improvements, it is easier to undertake them than to carry them out; and that has been found so here. Nevertheless, your committee, after considerable hesitation and a good deal of advice freely solicited and sometimes freely volunteered, has arrived at certain preliminary conclusions. These were stated in the rough at the last meeting, and in the main were adopted by this Association as expressing its desire; but I am sure that I am voicing the feelings of the Associa-

tion, as I know that I am the feelings of the committee, when I say that we realize fully that these rules are tentative and experimental, subject still to criticism and amendment. It should also be borne in mind that they are only suggestions and recommendations to boards of health, and that each board of health may, if it chooses, neglect them altogether, carry them out in part, or adopt them in full.

At the last meeting certain sections were referred back to the committee for amendment and, if possible, improvement; and the committee was also instructed to inquire whether the steps already taken were in line with the statutory law. These things have been looked into, and certain results reached. Before proceeding, however, to state precisely what the results are, I wish to repeat what has been said already several times as to the object of these rules. The object is a very simple one. It is to endeavor to bring the milk supply of modern cities and towns as far as is practicable up to the present standards of sanitary science; and in this respect, as the Association well knows, our ideas have changed within the last fifteen or twenty years very materially. A standard which was good twenty years ago is inadequate to-day; and it is our duty as representatives of the various cities and towns on the sanitary side, and as in a measure guardians of the public health, to endeavor to make action fit theory as far as is practicable, and only so far as is practicable.

The one main object which the committee has had in view all through has been the bringing about of greater cleanness. Everything, I think, may be reduced to that greater cleanness, because greater cleanness is going to mean a better sanitary condition, fresher milk, safer milk. With that in view everything else has been set aside. For example, as you will see, when I proceed to read the amended rules of the committee, it has not been deemed wise or necessary to introduce or attempt to introduce anything which is still seriously under debate,— such, for example as the tuberculin test, believing that, if we undertook to do that, in the first place, we should not be, perhaps, perfectly sure that all members of the Association would agree about the rules providing for the use of tuberculin, and, in the second place, that we should be trying to do something that we have not set out to do. What we are after is to get cleaner,

fresher, purer milk, and not to get milk that is beyond any of the modern reasonable requirements of any city or town or, as we believe, beyond the reasonable ability of any set of people supplying milk. To carry this out, we believe that all licenses for the sale of milk should be brought under the authority of the boards of health. The sale of milk is henceforward to be regarded as a sanitary matter. It is a matter of food supply as much as any other food, perhaps more than any other food, that man has; and it is believed that the boards of health are able to attend to that, and pronounce as to the sanitary condition of the milk, and not, as still is the case in some places, the so-called inspector of milk, not answerable to a board of health in any way.

It was pointed out at the last meeting that, in undertaking to do this and in recommending that boards of health should license milk dealers, and should look after the sanitary condition of dairy farms, the methods of handling milk *en route* and after its arrival in the city, there was danger of a conflict of authority between the inspector appointed by the mayor and aldermen and the boards of health, having separate authority. That fact was pointed out by Mr. Coffey, of Worcester; and your committee was instructed to look into the matter. On looking into it, they find that there is, in fact, danger of some such conflict. We have consulted eminent legal authority, and have been led to believe that there is probably the necessity in some cases — that is, in cases where the inspector is not already connected with boards of health — that there should be special legislation bringing inspectors under such authority. That is not the case in Boston, which has its special statute, but it is the case, I think, still in many cities and towns of the State; and so one recommendation of your committee to-day is that your Committee on Legislation should look into this matter, and endeavor, if possible, to secure the proper legislation, in order that boards of health, the proper and recognized sanitary authority, shall have power, if they choose to do so, to grant licenses for the sale of milk in their respective cities and towns. And, of course, that committee will have to act promptly, because the time for the admission of new business at the State House is limited.

With regard to the other point that was raised, as to the power of the boards of health to make ordinances such as these, and bring

them in line with the ordinary ordinance-making power, there seems to be comparatively little doubt. It is granted that, if there is any conflict between boards of health and the inspector of milk, the power of a board of health to establish these rules governing the milk supply is sufficient. But, before that conflict arises, perhaps it would be well for the Committee on Legislation to look into it.

There are certain verbal changes and errors in the rules as printed in the report, which, I believe, most of the members of the Association now have, as it should have been distributed to them, and I dare say has been.

For instance, in Section 1 it was stated toward the end that application "on forms prescribed by the board, for a permit or license," must be made. It was not said what board. It should be the "Board of Health of said city or town."

The same correction should be made in Section 3. "Local board of health" should be "Board of Health of said city or town." In other words, the conditions under which cows are kept should be made known to the local board of health of the city or town in which the milk is to be sold, not the local board of health in the town or village where the milk is produced.

Section 4 was one which made a great deal of trouble at the last meeting, and your committee is not altogether sanguine that it has got it in good shape now; but the form in which it is presented to you to-day is this: —

"SECTION 4. No milk shall be sold, offered for sale, or distributed in any city or town, unless the cows from which it is derived"— that word is "delivered" in the printed form — "unless the cows from which it is derived have within one year been examined by a competent authority, and shown to the satisfaction of the Board of Health of said city or town to be free from diseases dangerous to the public health. But this shall not be construed as forbidding the sale or use of milk from cows not tested with tuberculin."

In order to prevent all possible misunderstanding, the committee believed that we should exclude the tuberculin test from this set of rules. If the Association desires to take that up later, well and good; but, as I have already said, the object of these rules was primarily to secure greater cleanness and care of the milk. It was

not to prevent the use of milk from non-tuberculin-tested cows; and, therefore, it was thought that, in order to make it perfectly clear, we would say so. I will reread that section, and the Association can then adopt it either now or later. [Section 4 was then reread.]

Then one or two other sections were referred back, and we have taken the liberty of changing Section 2 of Article II. Although it was not referred back to us, we had no right to do so, perhaps; but, as now proposed, it reads as follows: —

"SECTION 2. Milk shall be stored or regularly mixed, cooled, or poured from can to can only in a room not directly connected with a stable or stables, provided with a tight floor, and kept constantly neat and clean, the walls of the room being of such a nature as to allow easy and thorough cleansing." The committee felt that this might be too severe upon some small farmers, so they have qualified it as follows: "or in some room approved by the said Board of Health." So that, if a man came and said that it would be a hardship for him to make a room such as is described, the committee thought it would be reasonable to qualify the rule as suggested,— that the room could be left for the approval of the Board of Health; and, if they should approve it, no undue hardship would be brought about. "Such room shall contain proper appliances for washing" — the former word was "*and* sterilizing"; but, as it is felt that people won't sterilize and cannot sterilize under ordinary conditions, it would be better to say "for washing *or* sterilizing"—"all utensils actually employed in the storage, sale, and distribution of milk in said building, and all such apparatus and utensils shall be washed with boiling water or sterilized by steam regularly after having been so used."

There are two versions proposed for Section 4,— one just as it is, and the other which amounts to leaving it just as it is; namely, "some room other than the stable, and not containing any urinal or privy, nor used for sleeping or other domestic purposes." Beyond this the committee was not instructed to go, and has not gone.

I will simply tell you, to repeat what I have already said, that these rules are intended to secure, in the first place, greater care, in the second place, greater cleanness, in the milk supply. The committee felt it very undesirable to bring in any elements which would inter-

fere with those primary and fundamental objects. If we can secure this, we shall be taking a great step in advance.

Finally, I think the committee feels that, after this matter has been disposed of, the Association may well address itself to the preparation of a circular of information which may be distributed to the farmers and others interested in the milk supply, showing how milk becomes contaminated and what sanitarians regard as proper care of milk. It is found that there is a good deal of ignorance on that subject. Sanitarians are thought, on the one hand, to require many things they do not require; and, on the other hand, they are not known to require some that they do ask for. And so in this form I think the committee may safely leave these rules with the Association. Stated somewhat roughly, there is need of more legislation in order to prevent confusion in granting licenses; and, second, there is need for the preparation of a circular of information.

I should like to say, personally, that, after thinking over this thing a good deal, I believe there might well go as a verbal statement from the Association — not to be printed with these rules, of course — the understanding that whatever improvement is made in the milk supply is to come along three lines. In the first place, from the producer, who should clean up, and see to it that the milk is more thoroughly cared for, to start with; in the second place, from the middleman or contractor, who should see to it that the milk is as safely and quickly transported and delivered to the consumer as is possible; and, in the third place, the consumer, whose milk supply has been based hitherto upon a low standard in all these matters, should do his part, and be prepared, if necessary, as I believe it will be necessary, to pay a higher price for safe, pure, and sanitary milk. I think it ought to be very distinctly understood by the Association and by our guests that in all these matters the one desire of this Association is the improvement of the public health. If these rules seem to some to bear hard upon some, it may be due to a misunderstanding or it is inevitable on account of the growth of the science. If it is a misunderstanding, we might hope to clear it up; but the fundamental object of the whole thing must, in any case, be constantly kept in view, and that is to bring the present system of milk supply in Boston and in Massachusetts up to the very highest standard practicable, and to keep it in line with the best sanitary science of the day.

THE PRESIDENT.— The Association has listened to the report of the committee. I presume that the only way in which this Association can intelligibly and intelligently enter upon this discussion would be article by article of this report, but it is simply a suggestion. What action will you take? Possibly, for the information of the Association, it will be well that all the rules should be read. If it is desired, we could then discuss each singly.

PROFESSOR SEDGWICK.— The heading, I think, is very important here,— "Rules suggested by a Committee of the Massachusetts Association of Boards of Health for adoption by the Boards of Health of the State for the Protection of Milk Supplies from Pollution."

ARTICLE I.

SECTION 1. All persons engaged in the production of milk for sale, or in the sale, delivery, or distribution of milk in the city or town of——, shall annually, on or before May 1, make written application, on forms prescribed by the Board of Health of said city or town, for a permit or license.

THE PRESIDENT.— Is it your wish to discuss this report article by article or to have the whole report read to you?

A MEMBER.— Article by article.

THE PRESIDENT.— The first article, then, is before the Association for discussion. I shall be very glad to hear from anybody who has anything to say upon the subject or to ask questions.

DR. MILLER.— Mr. President, I would like to ask one question. Some of these articles were adopted at the last meeting, and some were referred back to the committee. Now, if the chairman of the committee, as he reads these, if he is going to read the whole right along, would tell us which ones he desires the present meeting to act upon, or if there are any changes to be made, I think we should act more intelligently. Of course, those that were adopted at the last meeting do not need to be touched now.

THE SECRETARY.— Article I., Section 1, was accepted.

PROFESSOR SEDGWICK.— Article I., Section 2, Article I., Section 3, Article I., Section 4, were referred back to the committee.

DR. MILLER.— Then Article I., Section 4, would be the first one to consider, wouldn't it?

PROFESSOR SEDGWICK.— Mr. President, we have with us to-day a number of guests representing farmers and representing contractors; and it seems as if so rare a chance were too good an occasion for us to lose to hear from these gentlemen, and to learn whether they have any fundamental objections to any of these rules. And, although we have expected to meet objections, and it is very likely shall continue to do so, yet we should be glad to hear if there is any sound criticism of them, because our one object in all this is, as I have said, the real benefit of the public.

THE PRESIDENT.— I presume it is the wish of this Association to get all the information that it can upon the subject, and we shall be glad to hear anything that may be said upon this matter.

A MEMBER.— Mr. President, it might be that, an article having been adopted, some one present might have some valuable amendment to offer; and, if the articles are not too long, I for one would like to hear them read.

THE PRESIDENT.— We will proceed to do so. Is there anything to be said upon this Article I.?

A MEMBER.— Mr. President, as I understand it, the law distinguishes between milk, buttermilk, and skim milk. Now would it be any object to insert in Article I. "in the production of milk, buttermilk, or skim milk," or add the word "cream"? I ask this question because there are some practical troubles with this matter. Certain ones who sell buttermilk say they are exempt, or would say so; and others who sell skim milk would say the same, and some who sell cream would say the same. It seems to me it is of equal importance to have all these places kept clean.

PROFESSOR SEDGWICK.— That has not been considered. We are very glad of the suggestion.

DR. CHARLES HARRINGTON.— Mr. President, I would suggest that the Supreme Court of Massachusetts has decided that cream and skim milk are milk, so that is not necessary.

A MEMBER.— Mr. President, at the same time the law tells what we should do to protect dealers and those that sell; and in this case it seems to me just as desirable.

DR. HARRINGTON.— Mr. President, that question I have had occasion to ask many times, and I will simply say that those are varieties of milk. It is all milk.

THE PRESIDENT.— As I understand it, there is no motion made to amend.

DR. CHAPIN.— Mr. President, I should like to ask if this includes condensed milk.

THE PRESIDENT.— I do not know how it is in Rhode Island, but condensed milk is covered by special legislation in Massachusetts.

DR. BURR.— Mr. President, there has been a question raised in regard to this section concerning the wording in "the production of milk for sale." I think that there are some of the representatives of the milk producers here who perhaps can give us their view on that particular point; but the question is whether the producer of milk should be obliged to obtain his license for simply producing the milk? As I understand it now, a producer does not have to have a license. The one who sells is obliged to obtain a license: the producer does not have to.

PROFESSOR SEDGWICK.— Mr. President, the intention there was simply to affect a man who produces milk for sale; and I cannot myself see why it is not right to say "all persons engaged in the production of milk for sale,"— that is, not the production of milk for their own families or to supply their neighbors, but in the production of milk for sale. It seems to me that is perfectly clear. If it would make it any clearer to say "all persons engaged in the sale of milk," I think it would cover the same idea, because the man who raises milk and sells it would then be covered by it.

A MEMBER.— I would suggest that it be those "who are engaged in the business,"— let the business be the thing,— "who are engaged in the business of" thus and so.

PROFESSOR SEDGWICK.— The committee does not see that that makes any material difference. It is hard to see how anything can be clearer,— "all persons engaged in the production of milk for sale, or in the sale," and so on. If the Association think that ought to be cleared up, it can be done. It should be understood that this has already been adopted, and the chairman is now simply inviting criticisms. Unless there are pretty sound reasons for change, it seems unwise to depart from it as adopted.

DR. W. P. BOWERS.— One of the prominent producers in our section is here, and he has raised the question where he should get

his license. He wants to know whether, if anybody sends milk to Boston, he should get a license in Boston or in the place where he lives.

PROFESSOR SEDGWICK.— I think that is covered by the words "in the city or town." "All persons engaged in the production of milk . . . in the city or town of" blank. That is, for instance, if a man in Hillsboro Bridge, N.H., if there is such a town, is producing milk for sale in Boston, he does not have to get any license; but, if he is in West Roxbury, which is a part of Boston, he has got to get a license just as much as the man who delivers milk from the railroad station. This does not mean that farmers have not got to pay for a license at all,— nothing of that sort: that would be absurd of course,— but simply, if they are engaged in the production of milk for sale in such a town or in the sale of it in that town. Perhaps the punctuation might be improved, but that was the idea.

MR. GEO. H. ELLIS.— "All persons engaged in the production of milk for sale." I do not see why the Hillsboro Bridge man, who is producing milk for sale, has not got to get his license under that. I think, if the words "production of milk for sale to a consumer" were inserted, that would cover that; and, if the Hillsboro Bridge farmer is producing milk for sale, he has got to get a license.

PROFESSOR SEDGWICK.— It was not the intention of the committee at all. I think a comma after the word "milk" would fix the whole thing. It would then read, "any person engaged in the sale, delivery, or distribution of milk, in the city or town," and so on. The idea is not to license the farmer, but to license the man who sells milk in the city, and then to make him report what the condition of the farms is up in the country; but those farmers are not to be licensed. I do not think that was ever contemplated by the committee.

THE PRESIDENT.— As no motion has yet been made, the chairman of the committee will read the next article.

PROFESSOR SEDGWICK.— "Section 2. No person shall engage in the business of producing milk for sale, or in the sale or distribution of milk,"— and here the comma is in,— "in the city or town of" blank. It seems to be understood that there are farmers as well as milk pedlers in the city of Boston, and this was aimed at them as well as

at the pedlers; that is, if there is a farm in Dorchester or Roxbury producing milk, that farm within the city limits should come under this just as truly as the pedler who takes it from the railroad station. And I think that is covered by this clause,— "in the city or town of —— after April 30, 1898," or any other date, "without a permit or license to do so signed by said Board of Health, and under such conditions as said Board of Health may impose, revokable at the pleasure of said board." That, it seems to me, is perfectly simple,— no person shall engage in a city or town in the business of producing milk for sale, or in the sale or distribution of milk, without a license.

The legal member of our committee says it would be well to have the word "continue" inserted, so that it shall read "shall engage or continue in the business of producing milk," etc., in that city or town; but that was adopted at the last meeting of the committee, and, unless there is a motion to do so, it cannot be changed.

The President.— Is there anything to be said upon the section just read to you?

Professor Sedgwick.— "Section 3. The conditions under which every cow is kept, whose milk is brought into any city or town, or kept, delivered, distributed, sold, or offered for sale, in such city or town, shall be made known to the Board of Health of said city or town in such detail as the board may require, and shall be approved thereby; and no milk except that delivered from such cows,"— "derived" that should be again,— "derived from such cows shall be so brought, kept, delivered, distributed, sold, or offered for sale."

Now that, of course, is the attempt on the part of the Board of Health to get control of the conditions on the farm, but not by licensing. It is simply by requiring a statement or report to be made by the person selling milk in the city or town as to the conditions of the farms from which he derives his milk. That seemed to the committee, if this was adopted, to be without any question a perfectly rational and proper thing to do,— a very different thing from licensing a farmer, simply a means of getting information. Then, if the information shows that the farm is in a wretched condition, very unsanitary, the license of that particular dealer in the city can be cut off; and he would have to get his milk somewhere else.

THE PRESIDENT.— Is there any question to be asked with regard to this section?

A MEMBER.— There is one point I would like to ask about in the first section, where the producer of milk sells to a contractor. Some of the members do not quite understand how, if the producer of milk sells to the contractor, that is to be controlled. If he should sell to the contractor, how is he to be affected?

PROFESSOR SEDGWICK.— Well, so far as it appears on the face of it, it would be like this. The contractor would be a person defined here as selling milk in the city of Boston. He would therefore be required, as a condition of his receiving a license, to make known to the Board of Health, in such detail as that Board of Health might require, the conditions under which every cow supplying him with milk is kept; and he would practically, I suppose, have a blank with which the Board of Health would provide him, which he would mail to every farmer supplying him with milk in the town of Sterling. That farmer would fill it out, giving a statement, for instance, of the position of the privy with reference to the cow-barn, the condition of the stables, how the milk is handled, whether the cans are set just behind the cows while milking is going on, and so forth and so forth. A lot of simple facts like those could be easily filled out by any intelligent producer. The producer would send that back to the contractor, then, as a matter of course, the contractor would return it to the Board of Health, the Board of Health would look it over; and, if they felt it needed inspection, they would send one of their inspectors up there to see if the farm was really what it pretended to be. Of course, at first they could not send an inspector to every farm; but they would go at random to just a few farms, and raise the whole standard. The immediate practical effect would be at first very little; but the ultimate practical effect would be an intelligent inspection by the Board of Health, the inspector from the Board of Health saying to the farmer: "You think you are doing everything nicely, but here are such and such things that are not as they should be. You can see this won't do, and I shall have to recommend that your farm be cut off unless you do so and so." That is only my idea. That is the way I should do it if I was on the Board of Health; and I presume my friend, Dr. Durgin, would do it a great deal better and more reasonably than I should.

The next section is one which occasioned a good deal of debate at the last meeting, and very likely will at this, and was referred back to the committee for improvement. In its original version it was this: "No milk shall be sold, offered for sale, or distributed in any city or town, unless the cows from which it is derived have within one year been examined by a competent authority, and shown to the satisfaction of the local board of health to be free from disease." Then the suggestion was made by Dr. Smith — and it seemed to meet with considerable favor on the part of the Association — that this should be changed so as to read in the form given in the report. It was amended to run like this. It was suggested, also, by Dr. Theobald Smith that it should run in this way: "No milk shall be sold, offered for sale, or distributed in any city or town, unless the cows from which it is derived have within one year been examined by a competent authority, and shown, to the satisfaction of the Board of Health, to be free from diseases dangerous to public health." I think I have not got that quite right. I think he left out the clause about having been examined within one year. The committee, on going over it, recommends this instead of either of the others, — that it should stand as printed in the report, and go on as follows, the whole reading in this way: "No milk shall be sold, offered for sale, or distributed in any city or town, unless the cows from which it is derived have within one year been examined by a competent authority, and shown, to the satisfaction of the Board of Health of said city or town, to be free from diseases dangerous to public health. But this shall not be construed as forbidding the sale or use of milk from cows not tested with tuberculin." In other words, we set aside the tuberculin matter altogether. Not but that we have our ideas about it, but we did not think it worth while to raise the question of the tuberculin test in connection with this matter of cleanness. We realize there is a strong feeling on the part of farmers against tuberculin. We realize that tuberculin is not such a condition that it is best to put it in here. At least, that is my opinion. Some members of this Association may not agree with us, and think it is best to put it in; but that is the feeling of the committee. We had no other object in view in this matter than the protection of the milk supply, and cleanness in the methods of handling it. So we said we would

not go into the tuberculin test, and therefore added this last clause: "but this shall not be construed as forbidding the sale and use of milk from cows not tested with tuberculin." This section is now presented to you by the committee in that fashion.

A MEMBER (MR. ELLIS).— Mr. President, I agree exactly with the idea set forth by the chairman of the committee, and disagree entirely as to the last paragraph of that section. You do interfere with the tuberculin test by putting that clause in there. Its effect is to say to the boards of health in the local towns that they shall not adopt the tuberculin test in their own town. It seems to me that is just exactly what this Association does not wish to do. It should leave that matter wholly to the boards of health; but, in thus referring to that matter at all, you are introducing the tuberculin question. If you leave that clause out, it gives the board of health an opportunity to adopt the tuberculin test, if it desires to do so.

A MEMBER.— Mr. President, as one member of the committee, it was my understanding, when this clause was originally drafted without the test, that that was intended,— that, while we did not feel like providing explicitly for the tuberculin test, we proposed to allow local option in the matter, and let the local boards of health require it or not, just as they saw fit. I think the question of making this amendment is a mere question of expediency. If it is necessary to say explicitly that this is not to condemn the requirements of the tuberculin test, in order that it may have the support of those who do not like the tuberculin test, and object to it as a matter of expediency, then it is well to adopt it. If that is not necessary, I should prefer to let it stand as it was originally, so the boards may use their own discretion in the matter.

DR. BURR.— Mr. President, I should like to read a bill which has just been presented to the legislature, which gives each town the right to call for tuberculin, and under which each town can prohibit the sale of milk within its limits excepting from cows which have been tested with tuberculin. I think it is pretty safe to say this bill will be defeated. At any rate, I think within forty-eight hours there will be a bill in opposing that; and I have no doubt, if this Association leaves out that last clause, that there will be a bill in a very short time which will prevent boards of health using tuberculin.

THE PRESIDENT.— This section apparently brings in a very wide view of the whole question; and the Association, fortunately, has among its guests to-day a number of gentlemen prominently connected with the production of milk, and we shall be very glad to hear from them. I shall be very glad to hear from the Hon. C. A. Gleason, chairman of the Cattle Owners' Association.

HON. C. A. GLEASON.— Mr. President and gentlemen of this Association, I received the invitation to be here this afternoon with a great deal of pleasure; and it gives me especial pleasure to say a few words, although I do so with some hesitation as I meet this learned and distinguished gathering from all parts of Massachusetts. I have been interested in the milk question all my life. I have taken quite a large part in its production and in its sale here in Boston. I have listened with a great deal of interest to the remarks of Professor Sedgwick, and I have admired the candor and ability with which he has discussed the subject. I should agree most fully with all things that have been said. I believe that I represent an Association who would be heart and hand in delivering Boston pure, clean milk up to the legal standard. I presume a large number of this Association fully comprehend that, in order to do that, there is considerable effort and some skill required on the part of the producer. I presume most of the members, or many of them, understand that under existing circumstances, with the price of milk netted the farmers, it is a struggle for them to maintain an existence in many of the hill towns, and produce milk for the Boston market. Many of you know that there has been a good deal of agitation, a good deal of dissatisfaction, with the price obtained; but they all thought, "We stand here as an Association, believing that a good article of food is the only article that should be produced and sold here in the Boston market."

Now it seems to me that it is only reasonable that all due care in cleanliness should be used on the part of the producer to send such an article to the Boston market. So far as I know, a large majority of the producers are men who send good goods here. I am just as well aware that there is a certain per cent. that is produced among the producers of New Hampshire, Massachusetts, and Con-

necticut, that finds its way into Boston, that is not produced and cared for under the best conditions. I have seen nothing in this bill so far, until this discussion arose on the tuberculin question, that I should object to, and nothing that the producers of Massachusetts, either the New England Milk Producers' Union or the Farmers' and Cattle Owners' Association, would object to. I might say that for seven years I have been president of the New England Milk Producers' Union; and my place has this last week been taken by an able representative of the producers from Concord, Mr. Patch, who is here, and, I presume, would be glad to say a few words on the subject. That is an association that represents nearly all of the producers that send their milk into the Boston market. The Association that I represent more particularly here to-day is a much smaller Association, confined entirely to Massachusetts, but representing a large number of cattle owners; and we are deeply interested in this milk question, because our profit largely comes from the production of milk. We are a large company of producers, and we are working hand in hand, so far as we can, with the contractors of Boston to make a better quality of milk; and I want to say right here that the quality of milk that the consumers of Boston are receiving has improved very largely within the last ten years. The public demands it, and the conditions must be improved. The contractors insist upon it, and they are a greater power in carrying it out than any board of health can be. The cutting off of a dairy by the contractors will induce improved sanitary conditions better than any rules that can be passed here to-day. I think the contractors are the greatest power for the improved quality of milk that we can have; and I am glad to say, as they will say to you to-day,— they will bear me out in this statement, I am sure,— that the milk which was furnished in Boston ten years ago would not be received, much of it, to-day. I think that this, as has been suggested by the chairman of the committee, can be largely done by education. I am glad that these rules that have been presented are mild, because I feel that, if there was anything that seemed to be arbitrary, there would be so much opposition shown and manifested that it would be unpleasant, if not difficult, to enforce them.

But I would be glad to say one word here on the question of

tuberculin. I suppose that there is a wide difference of opinion upon that; but I think it would be very unwise, from my view of it, representing the large number of farmers that we do here to-day in the Association, to leave it an open question at least whether the Board of Health of Boston and other cities were to insist upon the tuberculin test. There is a very strong feeling, and it is getting stronger every day, that it should not be insisted upon; that the cattle that are producing milk for the Boston market should not all be tested with tuberculin. I can safely say, and I feel sure, as has been intimated here, that, if it was felt that this meeting to-day was going to insist upon it, this question would be carried from this room at once to the State House; and I think that there would be an increased interest over the question compared with what there was three years ago, and I should hope that these rules might be adopted by this Association in the form that they have been presented rather than the tuberculin test should be left in dispute.

Thanking you, gentlemen, for this opportunity, I am very glad to have met you here this afternoon.

THE PRESIDENT.— The Association would be very glad indeed to have Mr. Patch address us upon this subject.

MR. PATCH.— Mr. President and gentlemen, I do not think I can add very much to what the Hon. C. A. Gleason has already said; but I believe that the milk producers of New England are hand in hand to produce a good article of milk to be delivered in the city of Boston, without going to any unreasonable expense in so doing. I believe, if they could feel that they would be compensated for producing a better article, they would be ready and willing to do it, a large majority of them; but I do not think that they would be willing to be compelled to have all their cattle tested with tuberculin, and I for one would hope that this resolution might be adopted as it has been read instead of leaving it open for discussion.

THE PRESIDENT.— The honorable ex-president of the Cattle Owners' Association has called attention to the contractors. I am sure we have no better or more acceptable specimen of a contractor than Mr. Whiting, and I hope he has something to say on the subject.

Mr. Whiting.— Mr. President and gentlemen, I feel very much complimented in being invited here to-day. The subject under consideration is one in which I have been interested throughout my business life; and, as I was saying to Professor Sedgwick, many of the suggestions and recommendations made by your honorable board are very encouraging, as they are along the lines that we have always contended were of great importance to the milk business in general. For more than thirty years we have urged upon our farmers the importance of being more cleanly and more systematic in the care of their milk. We have urged that it could be done without any more trouble or expense, and, in short, that uncleanliness is only a bad habit.

I do not mean to insinuate that the farmers (many of them at least) are not willing to do what is right, when made to see it; but they are very much inclined to think that any invasion upon their old traditional customs is unnecessary and only an additional burden imposed upon them by their wicked contractors. In fact, as some of you know, they feel that we are responsible for about all of their woes; while we, on the other hand, try to show them that they are indebted to us for most of their blessings. Be that as it may, there is great opportunity for improvement without injuring or causing unreasonable expense to any one. There are so many good suggestions in your last report that I hardly know where to begin the discussion of them.

As Professor Sedgwick has said, there can be no hardship in cleaning up the cow stables; and the best farmers will not object to it, and those who do object should be compelled to do it.

I think the quality of the milk brought to Boston market is much better than it was ten or fifteen years ago; and, while we have many complaints from farmers that the standard is too high, yet I believe we are gradually working up to it, and every year it is being accomplished with less friction. Dr. Harrington, as you know, is doing good work in his department. We think he is pretty rigid sometimes, — possibly, a little unreasonable; but from personal experience we feel confident that he shows no partiality. I am a firm believer in the idea that whatever is really desirable for the promotion of any good cause or object can be accomplished if approached in a business-like and reasonable way.

The farmers feel that they are not receiving money enough for their milk, and I am inclined to agree with them.

And I will go a step farther, and say that I don't know of any one in the business who is getting enough or what he really ought. Now one way that the farmer is going to get more for his milk is by your assistance in getting better prices for it here, in convincing the consumers that, if they want a really good article of milk, they must be willing to pay for it. You cannot get something for nothing, which seems to be the desire of too many milk consumers in Boston.

One of the best suggestions that I have seen in your report — one which, I believe, if adopted, would result in the best good to the business generally — is the licensing of milk distributors. If the sanitary condition of milk is of so much importance to the health of a city or town, why should a man be allowed to engage in the delivery of it until he can show to the proper authorities that he has conveniences for doing the business in a decent and sanitary manner? In the first place, a man to engage in the business should be a man; and the absence of this condition would prevent many applicants. He should have facilities for doing his business, such as suitable cans, a respectable-looking team, and all the conveniences for caring for his milk while in his possession. In addition to this, let him pay a good license,— say a hundred dollars,— that will keep out a low class of milk dealers, who go into the business only for what they can make by cheating and defrauding honest dealers.

Men who intend to be square will not object to such a license; and it would materially help Dr. Harrington in paying the expenses of his office, and possibly save some poor innocent from suffering. In order to give a farmer more for his milk and encourage him to raise better milk, all the waste places must be stopped; and we, as contractors, feel that we are partly entitled to all the influence of a healthful public sentiment and reasonable laws.

We want your assistance in enforcing proper sanitary conditions among the farmers. We can work together in accomplishing this much needed improvement, for it is the fountain-head of the whole milk problem. Good milk can never be made from poor milk.

To my mind, the ideal way of carrying on the milk business in Boston — and one which, I think, may come in use, to some extent,

before long — would be to have the milk brought to the city in large cans, the cans to be owned by the contractors. I would then filter the milk, — a process which, I am sure, would make it more cleanly, — and by cold-air process cool down to forty degrees, then put it up in cans or bottles, as required by the trade, after which I would replace in cold-air storage instead of the innumerable ice-chests used at present, some of which, I fear, are not any too clean. This plan would necessitate large storing and cooling capacity. But it would have the advantage of making the milk of uniform quality; and the cleansing and thorough cooling would, I am sure, improve the flavor and keeping qualities of the milk. It would also insure a prompt return of the cans to the farmers, as they would never go beyond the milk depot; and, by using this sized can, the number would be so much reduced that I think they could be hastily rinsed, and thus do away with much of the complaint of washing dirty cans. Another advantage would be that it could be made an attractive place for consumers to visit, and see for themselves where and how their milk is cared for. It would be imitating somewhat the plan adopted by Mr. Ellis, which, I am happy to say, is the best I have ever seen: he seems to accomplish everything in the care of his milk in a perfectly simple and natural way.

I should like to make a little addition to some of your rules which you have recommended. I think it would be of material assistance to the business. I have drawn up the following in connection with Section 1. I only added a few words. The section reads like this: —

"All cans, bottles, or vessels of any sort used in the sale, delivery, or distribution of milk to the consumer, must be plainly marked with the name of the owner of the milk route from which said milk is delivered, and must be cleaned or sterilized by the milk dealer before they are again used for the same purpose."

It seems important to me that each person handling milk should be held responsible for the part that he takes in it. If a man leaves milk at the door of a house, his name should be on the can, so that, if there is anything wrong about it, the trouble can be located. It would also assist in ferreting out complaints of constant thieving, not only of cans that are empty, but of cans that are full; for, while

a man is not obliged to have his own name on the can, if he can use anybody's can, it is a very easy thing for him to go to a door where these cans are set out at three or four o'clock in the morning, and take them. This expense alone is a very serious one.

I am happy to pledge the support of the contractors in assisting you in any scheme that will promote the general interest of the milk business.

THE PRESIDENT.— The last word will never be spoken upon this subject — here, at any rate — until we hear from perhaps the most competent representative of the other side of the question, to whom this community owes a very great debt, and to whom this Association will listen with the greatest attention. That is Dr. Harrington, of Boston.

DR. CHARLES HARRINGTON.— Mr. President and gentlemen, the ground has been so well and thoroughly covered that I feel that there is very little left for me to say. I do not propose to say anything about the tuberculin test. There have been enough hearings at the State House to show that it is not advisable to do anything further about that at the present time, but I want to say that I am heartily in sympathy in the movement for obtaining a supply of clean milk. I think it may fairly be said that our supply of milk is pure enough, so far as adulteration goes; but I think it is very necessary that we should obtain a cleaner supply. Now much can be done, it seems to me, by the rules and regulations suggested and by legislation, and a great deal can be done by educating the public sentiment a little more in the line of clean milk. I think the consumers are very much to blame for the fact that our milk supply is not cleaner. They do not insist on having a cleaner supply. I believe in having the milk clean when it is milked, and kept clean until it is put on the consumer's table. Our milk supply is subjected to more or less uncleanliness at its point of origin. It is subject to more or less while it is in transit. It is then subjected to a considerable source of contamination while it is in storage, and it is this last source which the public could very easily avoid if it only knew enough to insist upon it. Our milk supply in Boston gets in here early in the morning and during the forenoon. If the milk could

then be distributed to the consumer, it would be in a great deal better condition than when it is distributed. The milk is carried from the railroad, where it is received, to the various stables of the delivering milkmen. Now I have taken the trouble to go around and examine all the stables in Boston where milk is kept and handled prior to its delivery to the customer; and, as a rule, the conditions in Boston are very good. I also examined the stables in the outlying towns, the stables of milkmen delivering milk within the city; and with some exceptions their condition was very good, or at least fair, and some of them were in a disgraceful condition of filth. Now there is no necessity of having this milk stored in any of these places, whether they are clean or filthy. The milk may just as well be delivered when it gets in Boston, but the public won't have it. If a milkman should address a circular letter to his customers, stating that on and after that date he was going to deliver milk at eleven o'clock in the morning, he would lose all his customers, because they would say: "We don't want it delivered so late as that. We want milk delivered early. We want it fresh." And so the milkman is obliged to send this milk, which they want fresh, which comes in by the railroad at eleven o'clock, and store it in his stable in his refrigerator, which, as Mr. Whiting has said, is never strictly clean; and then the next morning at six o'clock it is delivered right fresh from the cow [laughter], and during this time it has had every opportunity to acquire new filth, and also to form a considerable multiplication of the bacteria that are already in the milk when it is sent down.

Mr. Gleason has touched on a point where I think I can cordially indorse him; that is, on the power that the contractor has in assisting in this movement for pure and clean milk. Whether there are or are not regulations, the contractor has the right, and would undoubtedly exercise it, of shutting off the milk supply from any dairy where the cows and surroundings are not kept in a good sanitary condition; and it would be only necessary, it seems to me, in some cases, if the contractor should insist upon that, that they would not receive milk unless it was clean.

As to whether the contractors and farmers get all they ought to for their milk, I do not know. It has always seemed to me that the

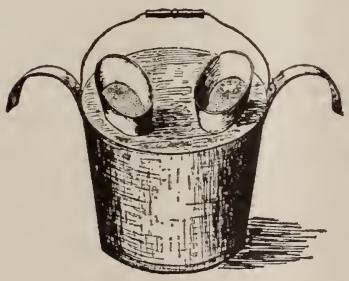
contractors did fairly well. They seem to be in a reasonable state of prosperity, and it always seemed to me that the farmers did not get quite all they ought to have. I do not want to precipitate a discussion on that point; but I think, if the farmers knew the power that they might have if they should go out on a strike, they would get more money for it.

A Member.— Do you keep cows, doctor?

Dr. Harrington.— Two.

The President.— With regard to the last suggestions of Dr. Harrington as to cleanliness of the milk supply, Mr. Walker has, as I understand it, an improved milk-pail which we would be glad to hear about. I do not know but Mr. Walker would be glad to say something about it in a word or two.

Mr. F. H. Walker.— Mr. President and gentlemen, I am pleased to be accorded the privilege of attending this meeting as a guest, and to have the additional privilege of stating a few facts regarding the Climax Milk Pail, and results obtained from its use.



This device is a pail equipped with cover, funnels, and strainers in such a way that the milk, in its passage from the cow into the pail, must go through these strainers. The pail is also supplied with hooks, which support it on the milker's knees.

I agree with Mr. Whiting and Dr. Harrington that more care should be exercised at the very beginning. In fact, I believe, like the young lady school-teacher who took a refractory urchin over her knee, in going to the bottom of things.

I am positive, after careful investigation and trial, that the use of the Climax Milk Pail will accomplish certain results along the lines of convenience and cleanliness. It will not change milk drawn from a diseased cow into a first-class, pure article. It has nothing to do with the after condition of milk, caused by pouring or repouring into dirty cans or those requiring sterilization. It will not prevent the

spread of contagious diseases, such as typhoid and scarlet fever, when the milker is afflicted with one of these diseases. It is not offered as a solution of the milk problem in its entirety, nor as a cure-all. It does, however, accomplish more than the practice of grooming the cows, and in much less time. Careful grooming is a splendid thing, but very few people are disposed to take upon themselves this extra work. Yet, with the utmost precaution taken, hairs and other articles will drop into the open pail. The Climax Milk Pail cover keeps out of the milk, during the process of milking, dirt, hairs, and pieces of cow manure, which latter sometimes give a peculiar flavor to the milk.

In accomplishing what it does, the pail supplies a long-felt want; and it is perfectly amazing to me, gentlemen, that a device of this kind has not before been put on the market. If puddings, pies, and other foods, prepared in our homes, were exposed to contact with foreign matter, as is milk in the open pail, many of us, I fear, would be loath to partake of them. The continued use of the open pail is of course largely a matter of habit. To quote from Lord Lytton, with but little change, "Use and habit are powers far greater than the dictates of common sense in this world of ours."

At the Boston Food Fair last October, where the pail was first shown and where several hundred were sold, it attracted not only the attention of the every-day farmer, but was also personally shown to many in all walks of life, business and professional. Ninety-nine out of every hundred, I am certain, were favorably impressed with the device. Knowing, therefore, that public opinion — that average opinion of the people in which President Lincoln reposed the utmost confidence — indorses it, I hope to see it generally adopted. The pail is retailed at a reasonable figure, and the price is not a fancy combination one.

Upon investigation I find that devices of the general nature of the Climax Milk Pail are not unknown to the Patent Office; but on account of complex and complicated parts, and various silly notions embodied in their construction, these articles could not be produced at a reasonable price, and were, therefore, not put on the market. Some of the devices were as complicated as a Corliss engine, and decidedly impractical.

I am heartily in favor of rigid inspections, and of keeping clean and sweet all places of storage and all cans used for the reception of milk, also of Pasteurization of milk, if this is found beneficial and necessary. I believe that those practical, educated, and thinking men who are contributing so much time, study, and discussion to the better care and inspection of milk are doing a grand work. But inspection, however rigid it may be, will not accomplish everything. It ought to, and I hope will in the future, compel a more proper care of milk, stable, and surroundings. It is a fact, however, that inspection and experience born of inspection have done but little to prevent foreign substances from entering milk in the open pail. The idea has been to strain them out afterward. An ounce of prevention is certainly worth more than a pound of cure.

The President.— Is there any gentleman here who wishes to say anything further about Section 4? We shall be very glad to hear from anybody, whether a member of this Association or not.

A Member.— Mr. President, we have a gentleman here from Pittsburg who has been very active in the Farmers' Association, Mr. Harrington; and I should like to hear from him.

The President.— We shall be glad to hear from Mr. Harrington.

Mr. Harrington.— Mr. President, I am a common farmer, a born hayseed. So you must not expect from me any words of wisdom. I have been for some years secretary of the Farmers' and Cattle Owners' Association, and I am certainly glad to see this movement in the line of cleanliness in milk production. I would say that our Association, as has been said by our president, Mr. Gleason,— that, in all reasonable matters bearing upon the production of clean, wholesome milk, the Cattle Owners' Association of Massachusetts is with the boards of health. There are some things which enter into this matter from a producer's standpoint which perhaps, as boards of health, we are apt to forget. In the first place, it must be realized that farmers at the present time are producing milk for the Boston market at next to nothing, if anything, above the cost. In fact, I firmly believe that just now milk for the Boston market is being produced by the farmers at less than cost.

The vast majority of the farmers of Massachusetts are holding on, hoping for better times and better prices, and are producing milk now at an actual loss, with a hope that in time they may better their condition. At a Farmers' Institute, only last week, it was demonstrated without a shadow of doubt that the cost of production was above the price received at the railroad station. Now we all wish to produce better milk; and, while we are willing to put forth every effort possible, the boards of health, I hope, realize — I believe they realize — that the condition imposed upon the farmers must imply very little added cost at the present time. Perhaps more can be done in the line of education than in the line of legislation. I believe the farmers are willing to come up to a better standard just as fast as they can or as fast as they realize the absolute necessity of it; but it must also be remembered that the vast majority of people,— as has been said, I think, by Dr. Harrington, of Boston,— a vast majority of people look at the cost rather than the quality. I sell my milk in the Pittsburg market, and I know that nine-tenths of the people in the city will look at a cent a quart before they will at the better quality of the milk.

Mr. Whiting.— The question under discussion, I believe, is whether this Association shall leave the tuberculin test optional with boards of health or whether they shall plainly state their position. Now the Farmers' and Cattle Owners' Association was organized primarily to oppose compulsory tuberculin. They oppose it. Compulsory tuberculin is a thing of the past. I am sure it will never again be required by the State of Massachusetts. I believe, if the Association here will pass the resolution that has been offered by Professor Sedgwick, just as it has been offered by him, that the Farmers' and Cattle Owners' Association, if there is legislation needed,— and there doubtless is,— is willing to go before the legislature and help in passing just such a bill. Last year there was passed also a bill which gave to the boards of health just the power which is in this resolution, minus the tuberculin provision. Our society added a proviso practically like the suggestion presented by Professor Sedgwick. That suggestion was not accepted by those who promoted the bill, and we defeated the bill. So I think, it is safe

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to say that we defeated the bill. I know that to be a fact. Our Association went before the Committee on Agriculture. We looked up the members of the legislature, and a bill was reported. The promoters were given leave to withdraw. Now, if this Association will declare itself one way or another on this matter, the Farmers' and Cattle Owners' Association are ready to work with the boards of health in any way which will promote health, which will promote wholesome food, and which will promote clean milk. We stand unutterably committed on the question of tuberculin.

THE PRESIDENT.— Is there anything further to be said on this subject?

DR. SMITH.— I think that this Association should not leave the subject here without taking some position upon the subject of tuberculin. I do not mean to say that tuberculin should be compulsory throughout the State; but I think, as a scientific organization, we at least should not turn our backs completely upon a diagnostic agent which is just now beginning to increase in its use in the medical profession, on account of the delicacy of this diagnostic subject in proving tuberculosis. It seems to me that putting in a clause that tuberculin should not be used would imply that the Local Boards of Health of Massachusetts are doubting the value of tuberculin; and I think this is a serious mistake. At the present time I believe that there are men in the State who have their cattle tested, and who try from time to time to rid themselves of tuberculous cattle. However, that is done at present at the expense of the State; and, therefore, it is difficult to see how there is any difference between those men and the men who do not have their cattle tested. It seems to me that, if there are men in this State who will take upon themselves the personal expense of having their cattle tested, and having the affected cattle weeded out, this Association ought to give those men its heartiest support, and recommend its policy voluntarily. I mean that this body, as a scientific organization, should not consider tuberculin as a useless agent, when it is making progress throughout the world. To-day in Germany, for instance, it is used more than it was two or three years ago, and it will continue to be used; but I am not at all so sure that ten years from now it will

not be used in Massachusetts. I am not at all sure that it will not be asked for by prominent men who are handling cattle. I think that time is coming; but I think it must come, of course, through co-operation of those who have charge of those animals.

DR. MILLER.— Mr. President, it seems to me that we can do no better than to adopt that article as just read by the chairman of the committee. It is impossible for every one here to-day to study it exactly, and I therefore move that the article be adopted as read by the chairman of the committee.

THE PRESIDENT.— Mr. Ellis has previously moved, if I understand him, that this article be amended. What is your pleasure with regard to the amendment proposed by Mr. Ellis ?

PROFESSOR SEDGWICK.— Mr. President, if I may say one word in further explanation, I should like to say that I do not believe that this clause commits the Association pro or con. It simply sets this thing aside. It says certain things as printed already, and adds, "this shall not be construed as forbidding the sale or use of milk from cows not tested with tuberculin." It does not say that it is not a good thing to test cows with tuberculin. It simply says, if a man brings milk to the city, and is asked, "Have your cows been tested?" that the milk shall not be excluded because the cows have not been tested. It does not say that the Association does not believe in tuberculin or anything of that sort, and it has been very carefully arranged with that in view. I grant, as Mr. Ellis holds, that it seems, or might seem to any one reading it, to minimize somewhat the value of tuberculin. Personally, I am quite willing to take that stand. I do not feel that tuberculin is to-day in such a state that this body as a scientific Association, as Dr. Smith has said, needs to take any positive stand one way or the other on that matter; and I cannot see how this phrase, that "this shall not be construed as forbidding the sale or use of milk from cows not tested," throws any more than a very slight doubt on tuberculin. I think that it does throw such a very slight doubt; and I think that doubt is justified by the present state of the tuberculin question, so that I do not think that this organization will be facing backward if it takes this stand. It simply sets the thing aside: it says, for our present purpose, we shall not exclude milk from untested cows. I dare say, if this Asso-

ciation should take a vote, it would say, on the whole, it thought it well to test cows; but, in the present state of the question, it sets the whole thing aside, and throws only that very slight shadow which I have spoken of upon the use of tuberculin. I hope the resolution will be carried as it stands, because I believe greater good will be done by adopting it than by defeating it. As I understand the matter, it is not that these gentlemen, representing the Milk Producers' Union, Cattle Owners' Association, and so on, make any threats. It is not that. Nor are we afraid of any threats, if made; but simply forgetting the greater good we are willing to set aside, for the time being, and put out of consideration, the question of tuberculin-tested cows as milk producers.

Mr. Ellis.— Mr. President, it seems to me that is just exactly what is done. I am still obtuse enough not to see that question as the chairman of the committee does. It seems to me that without it, if you leave the whole matter in the hands of the local boards, you leave it exactly where a stand can be made without this Association expressing its opinion. If the Cattle Owners' Association care to, they can go before the legislature, and have some special act with reference to the tuberculin test. That has nothing to do with this. That does not affect this question at all, but this is putting this Association on record against the tuberculin test or it has no effect.

The President.— Is anything more to be said upon Mr. Ellis's amendment? If not, all those in favor of the amendment proposed by Mr. Ellis will signify it by saying ay. [The vote was taken.] The chair believes it to be a vote: it is a vote. The section that "this shall not be construed as forbidding the sale or use of milk from cows not tested with tuberculin" is stricken out.

Professor Sedgwick.—Mr. President, I voted under a misapprehension. It is possible others may have done the same. Dr. Durgin was talking to me, and by mistake I voted for Mr. Ellis's amendment.

The President.— I am afraid one vote would hardly make any difference. The vote was not doubted.

A Member.— I beg to doubt the vote.

Dr. Miller.— Mr. President, I think if you would read it, we could all understand it better.

THE PRESIDENT.— The question is upon Mr. Ellis's motion to strike out the words, "but this shall not be construed as forbidding the sale or use of milk from cows not tested with tuberculin." The question is now whether those words shall be struck out. All those in favor will please rise and stand until they are counted. [The vote was taken.] It is not a vote. The question now is upon the adoption of the article as reported by the committee. All those in favor of adopting the article as reported by the committee will say ay. [The vote was taken.] It seems to be carried by a unanimous vote. The next article with regard to which there is any amendment is Section 2; and, as I understand it, that was adopted at the last meeting, but it is now proposed by the committee to add to it a few words, which, I understand, are simply in the way of definition.

PROFESSOR SEDGWICK.— Section 2. This was adopted, as the President says; but it is proposed by the committee, voluntarily proposed on their part, to give a loop-hole for the men who cannot possibly afford a really good room, and to insert after the word "cleansing" "or in some room approved by the said Board of Health."

THE PRESIDENT.— Is it your pleasure to amend this article by adding these words, which do not change the sense of it? If you are so minded, will you please signify by saying ay? [The vote was taken.] It is adopted.

The next section amended or, in fact, not accepted at the last meeting of this Association is Section 4, which originally read, "All milk directly after it is drawn from the cow shall be at once taken to, and be at once filtered, cooled, and stored in, a room such as is described in Article II., Sections 1 and 2." The committee now propose that it shall read, "All milk directly after it is drawn from the cow shall be at once taken to, filtered, cooled, and stored in, some room other than the stable, and not containing any urinal or privy, nor used for sleeping or other domestic purposes."

DR. DAVENPORT.— Mr. President, if the chair will allow me a question, I did not quite hear back here just what that means. I would like to know whether it means that cans can be in the barn and milk poured into the cans after it is drawn from the cow and then removed, or that the milk-pail filled up full must be taken imme-

diately to the barn or some adjacent room. Now that would make quite a difference in the expense and work of the farmer, as I understand by that clause. If it means every pail full of milk shall be carried from the stable before it is deposited in the cans, why, it means quite a heavy burden upon the farmer. If it means that it may be placed in the cans and the cans removed, why, that is quite a different thing. I should like an interpretation on that.

THE PRESIDENT.— I will ask the chairman of the committee to inform him.

PROFESSOR SEDGWICK.— This was the suggestion of only one member of the committee. As I understand it, the idea was that it was a bad thing to have cans standing near the tails of the cows, perhaps with open mouth, and it would contribute to general cleanliness if the man, after filling the pails, were to go into the next room and empty the milk there. Of course, if that involves very serious hardship, the committee might be willing to reconsider the matter; but it does not seem the proper thing to have the can behind cows, as it often is in the stable, and it does make more space needed. But, if the room were provided, as it should be, and then separated a few feet from the barn or from the stable, I do not know that it would be very serious, hardly more than to walk across from the yard to the place where the cans were set.

DR. DAVENPORT.— Mr. President, I should like further to know from you, not to invite trouble here, how that is to be done in a room. Would it not be well that it be done out of doors, to add to the word "room" "space"?

PROFESSOR SEDGWICK.— There is a qualifying clause,—"or some place approved by the Board of Health." If a man can show it is better to do it out of doors, I do not think there would be any trouble on that.

THE PRESIDENT.— It is moved and seconded that the section as originally read stand as the opinion of this Association. What is your pleasure thereon? All those in favor will signify by saying ay. [The vote was taken, and the motion was declared carried.] The only other section referred to the committee, on which I understand that no action has been thus far taken, is Section 2 of Article V.

PROFESSOR SEDGWICK.— Mr. Chairman, in regard to Article IV., I think the suggestion of Mr. Whiting is very good. His suggestion is this: "All cans, bottles, or vessels of any sort used in the sale, delivery, or distribution of milk to the consumer, must be plainly marked with the name of the owner of the milk route from which said milk is delivered, and must be cleaned and sterilized by the milk dealer before they are again used for the same purpose." In other words, he introduces this to facilitate keeping cans clean. One of the greatest abuses is dirty cans, which arises under this system of trading cans and stealing cans, and all that sort of thing. It seems to me that would be a very good suggestion,— to change Article IV. He also suggests on this type-written sheet, "It shall be deemed a sufficient reason for forfeiture of license for any milk dealer to fill or use in any way a milk vessel for any other purpose than milk." I am sure it would be a good thing if it was understood to be a sufficient reason for the forfeiture of a license if the vessels were used for any other purpose than for milk. I think these are very valuable suggestions from Mr. Whiting, and I move that both of them be incorporated in Article IV.

THE PRESIDENT.— Is it your pleasure that Article IV. be amended by introducing the words and sentences read to you by Professor Sedgwick?

A MEMBER.— Mr. President, I would like to amend that by changing one word,— "must be cleaned *or* sterilized."

PROFESSOR SEDGWICK.— Well, Mr. President, in this case it is the milk dealer who is concerned; and he ought always to have a place where he can do the work properly. I do not think there would be a great deal of trouble arising in the city between the contractor and consumer; and it would not be felt to be a hardship there to keep the word "and," while in the case of the farmer who had not reasonable apparatus it might be a real hardship. I do not care to insist on it, however, because I suppose practically he never will really get it thoroughly sterilized; but I do not think it is too high an ideal for the man who sets up milk in his stable, near the tails of his horses, to try to rise to. I think that is where a great deal of trouble comes in, as Dr. Harrington has intimated also. These fellows who get milk from the contractor take it home, work it over, and set it by in

ways that are not at all desirable. Their cans might well be sterilized. I do not think it will be any great hardship for them to do it. I hope the time will come when that work will be done, and that milk will be kept where the horses' tails are not within ten or twelve feet of the setting-up process.

A MEMBER.— What is meant by sterilizing in this case?

PROFESSOR SEDGWICK.— It means the destruction of all germs.

A MEMBER.— That is, what is the method?

PROFESSOR SEDGWICK.— Whatever means may be necessary to accomplish it.

A MEMBER.— I think still it would be a hardship for the small country dealer in a small country town.

PROFESSOR SEDGWICK.— That is a point I am ready to admit. If that is true, I withdraw my objection. I think this Association is too apt to think of the Boston system. I grant the value of that suggestion, and am quite ready to make it "or" in the case of smaller towns.

DR. BURR.— I think the most of these bottles may have come from some house where there has been diphtheria or scarlet fever. I think that was why it was insisted on that the dealer should sterilize his cans which had gone to the consumer.

THE PRESIDENT.— Will you amend this section as suggested by Professor Sedgwick?

PROFESSOR SEDGWICK.— In regard to Dr. Burr's remark, he refers to what is really a serious matter, especially in the bottle trade, which has come in more and more. Bottles are left now in the Boston system, bottles are left at the houses of the consumer; and they may have been taken right into the room where people are sick with diphtheria or scarlet fever, just because they are attractive and instead of some other dish. They are then delivered to the milkman the next morning; and, as Dr. Burr has said, the committee felt that they ought to be sterilized largely on that account. That is undoubtedly a coming way for the spread of disease; but, if it is true, as the gentleman says, that it would be too great a hardship in the smaller towns to have the bottles sterilized, I do not care to insist upon it, but it seems to me that in time it ought to be done.

THE PRESIDENT.— The question, then, is upon the amendment

substituting the word "or" for "and." Is it your pleasure that the substitution be made? If so, you will signify by saying ay. [The vote was taken, and the amendment was declared adopted.] That finishes the general consideration of the portions of the articles and sections that were referred to your committee. Is it your pleasure now to adopt them as a whole, and instruct some proper committee to procure the necessary legislation to see that they go into effect?

PROFESSOR SEDGWICK.— Mr. President, I move that the Committee on Legislation be instructed to secure such modification of the existing law as shall be necessary to carry these recommendations and suggestions into effect.

The motion was seconded by Dr. Miller. The vote was then taken, and the motion was declared carried.

RULES SUGGESTED BY A COMMITTEE OF, AND RECOMMENDED BY, THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH FOR ADOPTION BY THE BOARDS OF HEALTH OF THE STATE FOR THE PROTECTION OF MILK SUPPLIES FROM POLLUTION.

ARTICLE I.

SECTION 1. All persons engaged in the production of milk for sale, or in the sale, delivery, or distribution of milk, in the city or town of ——, shall annually, on or before May 1, make written application, on forms prescribed by the Board of Health of said city or town, for a permit or license.

SECT. 2. No person shall engage in the business of producing milk for sale, or in the sale or distribution of milk, in the city or town of —— after ——— without a permit or license to do so signed by said Board of Health, and under such conditions as said Board of Health may impose, revokable at the pleasure of said board.

SECT. 3. The conditions under which every cow is kept, whose milk is brought into any city or town, or kept, delivered, distributed, sold, or offered for sale, in such city or town, shall be made known to the local board of health of said city or town in such detail as the board may require, and shall be approved thereby; and no milk except that derived from such cows shall be so brought, kept, delivered, distributed, sold, or offered for sale.

SECT. 4. No milk shall be sold, offered for sale, or distributed in any city or town, unless the cows from which it is derived have within one year been examined by a competent authority, and shown, to the satisfaction of the Board of Health of said city or town, to be free from diseases dangerous to public health;

but this shall not be construed as forbidding the sale or use of milk from cows not treated with tuberculin.

SECT. 5. All persons having a permit or license to sell, deliver, or distribute, milk in any city or town, shall keep a copy of the same constantly posted in a conspicuous place on premises and vehicles from which milk is sold or distributed or in which milk is kept or delivered.

ARTICLE II.

SECTION 1. No milk shall be kept for sale or distribution, or handled, transferred from can to can, or stored, in any stable or similar place or in any room used in whole or in part for domestic or sleeping purposes.

SECT. 2. Milk shall be stored or regularly mixed, cooled, or poured from can to can only in a room not directly connected with a stable or stables, provided with a tight floor, and kept constantly neat and clean, the walls of the room being of such a nature as to allow easy and thorough cleansing; or in some room approved by the Board of Health of the city or town in which the milk is to be sold or distributed. The room aforesaid shall contain proper appliances for washing and sterilizing all utensils actually employed in the storage, sale, and distribution of milk in said building, and all such apparatus and utensils shall be washed with boiling water or sterilized by steam regularly after having been so used.

SECT. 3. No urinal, water-closet, or privy, shall be in the aforesaid room or any room directly connected therewith.

SECT. 4. All milk directly after it is drawn from the cow shall be at once taken to, and be at once filtered, cooled, and stored in, some such room as is described in Article II., Sections 1 and 2.

ARTICLE III.

SECTION 1. Milk kept for sale in any store, shop, market, bakery, or other establishment, shall be always kept in a covered cooler, box, or refrigerator, properly drained and cared for; and while therein shall be kept tightly corked or closed, and only in such location and under such conditions as shall be approved by the local board of health.

ARTICLE IV.

SECTION 1. All cans, bottles, or vessels of any sort used in the sale, delivery, or distribution of milk to the consumer, must be plainly marked with the name of the owner of the milk route from which said milk is delivered, and must be cleaned or sterilized by the milk dealer before they are again used for the same purpose; and it shall be deemed a sufficient reason for forfeiture of license for any milk dealer to fill or use in any way a milk vessel for any other substance than milk.

ARTICLE V.

SECTION 1. Every person engaged in the production, storage, transportation, sale, delivery, or distribution of milk, shall immediately, on the occurrence of any case or cases of infectious disease, such as typhoid, scarlet fever, or diphtheria, either in himself or in his family, or amongst his employees or within the building or premises where milk is stored, produced, sold, or distributed, take care that the local board of health is notified of such case or cases, and at the same time suspend the sale or distribution of milk until authorized to resume the same by the local board of health.

SECT. 2. It shall be unlawful for any person suffering from a contagious or infectious disease, such as typhoid fever, scarlet fever, or diphtheria, to handle, transport, deliver, mix, taste, work over, or distribute milk, or to be in or about places where milk is stored, sold, or distributed, or to serve as a milker or milkman. No vessels which have been handled by persons suffering from such diseases shall be used to hold or convey milk.

THE PRESIDENT.— The next business upon the programme is "Remarks on the Use of Formaldehyde by Dr. Parks of New York, Dr. Brough of Boston, and others." Dr. Parks, of New York, is not here; and I understand some one will read his paper.

Mr. Charles E. Davis, clerk of the Boston Board of Health, then read Dr. Parks's paper, as follows: —

EXPERIMENTS WITH FORMALDEHYDE GAS AS A DISINFECTANT.

BY E. M. PARKS, M.D.,

BACTERIOLOGIST OF THE NEW YORK BOARD OF HEALTH.

At the suggestion of Dr. H. M. Biggs, I undertook, in March, 1897, a series of experiments for the purpose of testing the value of formaldehyde gas as a disinfectant for health department purposes. Later Dr. Arthur R. Guerard, assistant bacteriologist to the department, joined me in carrying on the work. The investigations were made in the health department laboratories of the city of New York, and the most important conclusions reached may be summarized as follows: —

1. *Disinfection of infected dwellings.*

The interior of dwellings may be superficially disinfected by means of formaldehyde gas, all apertures being tightly closed, when employed in the proportion of not less than 1 per cent. by volume strength (that is, by the evaporation, in a suitable apparatus, of six ounces of the 40 per cent. solution of formaldehyde per 1,000 cubic feet of air-space), the time of exposure to be not less than two hours.

Under these conditions the common, non-spore-bearing pathogenic bacteria are surely and rapidly destroyed, when freely exposed to the action of the gas. Spore-bearing bacteria are not thus, as a rule, destroyed; but, as there is no need to use a disinfectant which will destroy spores, except in rare cases, such as anthrax, and as in these special methods can be carried out, this is of little practical significance in house disinfection.

The penetrative power of formaldehyde gas, under the conditions ordinarily existing in house disinfection, is extremely limited, even when used in double the strength above mentioned, and with a very much longer exposure. Articles, therefore, such as bedding, carpets, upholstery, etc., should be removed to a disinfecting station

for disinfection by steam, hot air, or formaldehyde gas, in chambers specially constructed for the purpose. If this is impossible, the materials to be disinfected should be as thoroughly exposed as possible, and for at least six hours, to the gas.

2. *Disinfection of bedding, carpets, upholstery, clothing, articles of leather, books, etc.*

These may be disinfected by formaldehyde gas in the ordinary steam-disinfecting chamber, the latter to be provided with heating and vacuum apparatus and special apparatus for generating and applying the gas, which should be used in the proportion of not less than 10 per cent. by volume strength, the time of exposure to be not less than eight hours. In order to insure complete penetration of the articles to be disinfected, they should be so placed as to allow a free circulation of the gas around them; that is, in the case of bedding, clothing, etc., they should either be spread out on perforated shelves or loosely hung up. The addition of moderate heat (110 to 130 degrees Fahrenheit), with or without the aid of a partial vacuum, greatly facilitates the operation, the presence of a vacuum not being so important, apparently, as that of heat.

For the disinfection of upholstered furniture and other articles requiring much space, a very large chamber, or, better, a room which can be tightly closed and heated up to at least 100 degrees Fahrenheit, is to be recommended in place of the ordinary chamber.

In the disinfection of books it would be necessary to have the leaves kept open, so that the gas could pass through them, for which purpose a special apparatus might be devised. Shelves do very well, with books lying separate and on end.

Articles of clothing, etc., may also be disinfected on a small scale by spraying them with a solution of formaldehyde (40 per cent.), and then hanging them in an air-tight chamber for twelve hours.

3. *Disinfection of ambulances and other conveyances.*

Ambulances and other conveyances which can be *tightly* closed may be disinfected by means of formaldehyde gas, when used in the proportion of 10 per cent. by volume, the time of exposure to be not less than one hour. No gaseous disinfectant, however, is applicable to the disinfection of conveyances *which cannot be tightly closed.*

4. *Comparative merits of the various methods tested of generating formaldehyde gas.*

(*a*) The generation of formaldehyde gas by means of lamps, directly by the oxidation of wood alcohol, though simple in its application, is not to be recommended for disinfection, so far as our experience teaches, in such work as is carried on by health departments, for the following reasons: the yield of formaldehyde gas is uncertain; it is not devoid of danger from fire; it is rather expensive.

(*b*) The method of generating the gas from solid formaldehyde (trioxymethylene pastils), as proposed by Schering, is simple, convenient, efficacious in small rooms, and comparatively inexpensive. The multiplication of lamps, however, which would be necessary for use on a large scale, renders it impractical. Moreover, it has the objection of all lamps which are left burning unattended in a room,— the possible danger of fire. The simplicity and convenience of this method, nevertheless, commend it particularly for use on a small scale, either for deodorizing or disinfecting purposes.

(*c*) The Trillat system of disinfection is excellent in many respects. It is efficacious and reliable. The chief practical objections to its use are that the apparatus, being constructed to withstand a high pressure, is heavy and cumbersome, and not without danger, that it is complicated and requires constant care and attention, and that it is quite expensive.

(*d*) Lastly, the method, as *now* employed by the Sanitary Construction Company, of passing through a heated copper tube the formalin solution, is simple, easily managed by any one, devoid of danger, and convenient for transportation. It is still, however, more or less liable to get out of order and require repairs. We have lately found that the tube for the passage of the gas from the hot copper coil should be wide throughout, and should be a poor conductor of heat. This allows of increased production of gas, and lessens its deterioration in the tube. It is efficacious, and is the least expensive when the apparatus is to be frequently used. The apparatus, however, should be carefully constructed, and the operation properly attended, in order to obtain constant results.

5. *Comparative cost of apparatus and of production of formaldehyde*

and sulphur-dioxide gas per 1,000 *cubic feet of space, to be superficially disinfected as in dwellings. As used by us, it was as follows:—*

(1)	*Lilly Lamp* (large size):	
	Cost of apparatus	$60.00
	Cost of disinfection per 1,000 cubic feet	.25
(2)	*Schering's Disinfector:*	
	Cost of apparatus	3.00
	Cost of disinfection per 1,000 cubic feet	.21
(3)	*Trillat Autoclave:*	
	Cost of apparatus (now reduced to about $60)	100.00
	Cost of disinfection per 1,000 cubic feet	.11¼
(4)	*Sanitary Construction Company's Apparatus:*	
	Cost of apparatus	25.00
	Cost of disinfection per 1,000 cubic feet	.07½
(5)	*Sulphur Fumigation:*	
	Cost of apparatus	.03
	Cost of disinfection per 1,000 cubic feet, by burning sulphur, 3 lbs to 1,000 cubic feet	.08

Our trials have been made at temperatures between 50 and 110 Fahrenheit, in hospital wards (30,000 cubic feet), in dwellings, and in tight chambers. Typhoid, diphtheria, and staphylococcus cultures were employed. Thick and thin threads were used. The thin threads were always sterile after disinfection, except on window-sills and just in front of doors. The thick cords were frequently not sterilized completely by the methods of room disinfection above described.

In a word, we have found formaldehyde much better and less destructive than sulphur, though subject to some of its limitations, especially in the slowness of its penetration.

At this point the President, Dr. Walcott, retired from the meeting; and Vice-President Dr. S. H. Durgin presided during the remainder of the meeting.

The President.— There are other papers and remarks to be made upon this same subject, and we will defer the discussion until we have heard the other papers. The next will be by Dr. Brough, of Boston.

THE USE OF FORMALDEHYDE IN HOUSE DISINFECTION.

BY DAVID D. BROUGH, M.D.

These series of experiments with formaldehyde gas were undertaken at the request of the Board of Health of the city of Boston. The objects of the investigation were to find, if possible, the value of formaldehyde as a germicide for surface disinfection, its powers of penetration, and what reliance could be placed on its general application as a practical disinfectant in house disinfection such as occurs in the routine of health work. The first experiments were undertaken during the summer months, with especial reference to its germicidal qualities; and the second series in the fall had especial reference to the amount of the gas that it was necessary to generate to accomplish satisfactory results.

The experiments were all made in the various houses of the city that required disinfection on account of their having contained cases of contagious disease. The diseases for which disinfection was performed were scarlet fever and diphtheria. No selection was made in the rooms. They were taken as they came, from day to day, and were scattered over various portions of the city. Most of the rooms were in the poorer class of tenements in the central and densely populated areas of the city. Most of the tests were made in single or double rooms. A few occupied the whole suite.

The apartments were prepared for disinfection in the following way. Closet and wardrobe doors left open, drawers of bureaus and chests partly opened. The bedding, bedclothes, and wearing apparel loosely spread out or hung up to present as much surface as possible to the action of the gas. The crevices of the windows, cracks of doors, fissures about walls and flues, were closed by covering them with strips of gummed paper. This paper comes in rolls, is about two inches wide, and is very convenient and easy to handle. It closes the crevices very effectually, and prevents the escape of a large amount of gas that would otherwise occur.

The gas was generated from the ordinary 40 per cent. aqueous solution of formaldehyde. The apparatus used for generating the gas was the autoclave, manufactured by the Sanitary Construction Company. In the first series of experiments the autoclave was left in the room and the room sealed as the gas had commenced to be discharged and it was seen that the apparatus was working properly. The amount of gas to be generated was known by the amount of alcohol in the lamp beneath the autoclave which was used for heating the solution. In two of the first series the gas was passed into the room by means of a rubber tube and brass pipe inserted into the keyhole. The amount of solution in the cylinder at the commencement and at the end of the experiment was carefully measured.

At first, a small amount of calcium chloride was mixed with the solution of formaldehyde; but later the aqueous solution of formaldehyde alone was used.

The materials used in making the tests were silk threads and squares or strips of gauze, which had first been carefully sterilized by heat. They were then allowed to soak in freshly prepared twenty-four hour pure bouillon cultures of the organisms to be tested. After the threads and squares of gauze had been thoroughly saturated with the organisms, they were allowed to dry in the incubator at a temperature that would remove the moisture, but not interfere with the vitality of the organisms. The tests were all made with dried cultures, as this is the condition in which we would ordinarily meet them in the rooms requiring disinfection. In the dried condition the organisms are supposed to be more resistant to the action of germicides.

The bacterium regularly used was the bacillus of diphtheria. Other organisms, the staphylococcus aureus, typhoid, and anthrax, were occasionally used; but the diphtheria was used alone in the larger majority of cases. It was chosen because it is the most frequent known bacterium for which disinfection is required and the pathogenic organism most commonly met with. It represents a type of pathogenic organisms that have a fairly good resisting power to the action of germicides, and stands for a fair average of the non-spore-bearing pathogenic bacteria.

These threads and squares of gauze were taken to the apartments

to be disinfected, and distributed in various parts of the room just before the gas was allowed to escape. The outside door was sealed with paper strips, and allowed to remain closed for the usual period of from five to six hours.

Control cultures to prove the presence of the bacillus were made in every case. This was done by selecting one of the test threads or squares of gauze from among those to be used before the others were placed in the room. The bouillon was always carefully sterilized and tested before being used. The controls generally gave an abundant growth in from 12 to 24 hours.

At the end of the allotted time the room was opened. The gas was usually present in such an amount that it was impossible to enter at once. After a few minutes' airing it was possible to enter and get the threads, this gas causing only a temporary smarting of the eyes and irritation of the nose and throat. The threads were then picked up with sterilized forceps and placed in bouillon, which was brought to the room, or then placed in sterilized test-tubes and placed in bouillon in the laboratory. Possibly, placing them direct into the nutrient bouillon removes any slight degree of contamination from transfer.

The culture tubes were placed in the incubator at 37 degrees Centigrade, and allowed to remain for 72 hours or more. They were examined every day, but the results were only drawn from presence or absence of growth at the end of 72 hours. It frequently happened that no growth would appear at the end of 24 or 48 hours, while at the end of 72 hours there would be a very abundant growth of the organism. This would show that the organisms on the surface had been killed, but that those that were more deeply imbedded in the thread had not been destroyed, and regained their vitality as they were gradually soaked out under the influence of the bouillon. Whenever a growth appeared in the bouillon either in 24, 48, or 72 hours, a secondary culture was made on blood serum, and the preparation examined microscopically to prove conclusively the nature of the growth.

The materials and media for making the tests were kindly furnished at the bacteriological laboratory of the Harvard Medical School by Dr. Ernst; and to him and his assistant, Dr. J. W. Coolidge, I am deeply indebted.

The first series of experiments were made during the months of June, July, and August, 1897.

EXPERIMENT I. Room, 1,136 cubic feet, 32 ounces used. Exposure was for 5 hours. 24 serum tubes were freshly inoculated with pure cultures of staphylococcus aureus, diphtheria, anthrax, and typhoid. At the end of 72 hours there was growth present at the bottom of all the tubes, while there was none at the top.

II. Room, 1,204 cubic feet, 2 windows, 1 door. Dried cultures on silk threads of anthrax, aureus, diphtheria, and typhoid. These threads were placed in the bottom of sterilized test-tubes, and distributed in various positions of the room. The tubes were all placed upright. Exposure was for 5 hours, and 32 ounces of the gas were used. At end of 72 hours all the organisms gave abundant growth except the typhoid. This apparently poor result is to be explained from the fact that the formaldehyde and air being of about the same specific gravity, a cushion of air formed at bottom of the tubes and prevented the gas from gaining access to the threads.

III. Room, 1,144 cubic feet, 32 ounces used. Aureus, anthrax, typhoid, and diphtheria on 8 dried threads used. These tubes were placed in the horizontal position, and the threads placed near the outer end. No growth in any except the anthrax.

IV. In this and the subsequent experiments the bacillus of diphtheria alone was used. 20 dry threads of diphtheria. Room, 1,352 cubic feet, 3 doors, and 2 windows; regenerator placed in centre of the room; room closed for 5 hours; amount, 32 ounces. Threads placed as follows: 5 on various parts of the floor; 2 on chairs; 1 thread, 15 feet long, from ceiling to floor; 4 in one layer sheet; 2 in pockets of clothes; 3 between mattresses; 3 between pillows. Result, 72 hours: 4 on floor, sterile; 1 on floor, growth of non-pathogenic organism; 1 on chair, sterile; 1 on chair, growth of non-pathogenic organism; 2 in sheets, sterile; 2 in sheets, growth of diphtheria bacillus; 1 long thread from ceiling to floor, sterile; 2 in pockets, sterile; 3 between mattresses, growth diphtheria bacillus; 3 between pillows, growth diphtheria bacillus.

V. Room, 900 cubic feet; 8 diphtheria threads; exposure 5 hours; amount, 32 ounces. Result: 2 on floor, sterile; 1 on chair, sterile; 1 loosely wrapped in blanket, sterile; 1 in trousers' pockets, sterile; 1 between pillows, growth diphtheria bacillus; 1 between 2 mattresses, growth diphtheria bacillus; 1 in centre feather pillow, growth diphtheria bacillus.

VI. 5 dried squares of gauze, with diphtheria bacillus. Room, 594 cubic feet, 2 doors, 1 loose flue; room closed for 6 hours; amount, 28 ounces. Pieces of gauze placed in various portions on the surface. Result: 3, sterile; 2, growth of non-pathogenic organism, a spore-bearing bacillus.

VII. 6 dried squares of gauze with diphtheria. Room, 2,002 cubic feet, 2 doors, 2 windows; amount, 48 ounces; room closed 6 hours. Result: 1

placed in wardrobe, sterile; 1 placed on floor, sterile; 1 placed on top of bedstead, sterile; 1 placed in fold of sofa, growth of diphtheria bacillus; 1 placed between 2 mattresses, growth of diphtheria bacillus; 1 placed in 4 folds of quilt, growth not pathogenic.

VIII. 7 squares of linen cloth, with diphtheria bacillus. 2 rooms adjoining, with a capacity of 2,079 cubic feet, 2 windows, 1 door; rooms closed for 6 hours. Result: 1 placed in bureau drawer, sterile; 1 placed on floor, sterile; 1 placed on mantel, sterile; 1 placed on table, sterile; 1 placed in dressing-gown pocket, sterile; 2 placed between mattresses and pillows, growth of diphtheria bacillus.

IX. 9 threads and squares of cloth. Room and closet, 1,494 cubic feet; room closed for 6 hours; amount used, 32 ounces. Result: 3 placed on top of mattress, sterile; 1 placed on top of bedstead, sterile; 1 placed on top of pillow, sterile; 1 placed on floor, sterile; 1 placed on floor, growth slight of diphtheria bacillus; 1 placed on top mattress, growth not pathogenic.

X. 11 dried diphtheria threads. Room, 700 cubic feet, 1 door, 1 window; room closed 6 hours; amount used, 25 ounces. 3 placed on floor, sterile; 3 placed on top pillow, sterile; 3 placed in centre pillow, growth; 2 placed between mattresses, growth.

In this first series of experiments the results were practically harmonious in every case. Out of the 45 threads and squares of gauze used in testing the disinfection of surface in the right rooms, 39 were absolutely sterile, 5 gave growth of non-pathogenic organisms, 1 gave growth of diphtheria bacillus, showing that in more than 97 per cent. the diphtheria bacillus was killed when exposed to the action of the gas; and the result was same, whether the exposure was 5, 6, or 7 hours.

Of 9 threads placed almost superficial, such as wrapped loosely in sheets or placed in pack, 6 were sterile, and 3 gave growth.

Of the 17 threads used in testing deep penetration, such as placing between mattresses or pillows or in the centre of feather pillows, there was a growth in every case.

The average temperature of the days of the tests were 72 degrees Fahrenheit.

The amount of solution used was 27 ounces to the 1,000 cubic feet. There was in several of the experiments some calcium chloride used; but this amount was not measured, and the average amount of the pure solution would be somewhat less.

The conclusions that can be drawn from these expriments are: —

(1) That formaldehyde gas is a practically complete surface germicide.

(2) That it has very little or no penetrating power.

The next series of experiments was undertaken during the months of October, November, and December. These tests were carried on under practically the same conditions as those done during the summer. Rooms were of the same general class of tenements. The Sanitary Construction Company regenerator in the first form, and also in a new form, was used, with a coil of pipe under the cylinder, through which the solution of formaldehyde passed and became vaporized. The gas was introduced by the brass pipe passed through the keyhole. The exposure in all except one case was for five hours from the time the gas commenced to be discharged. The tests were silk threads on which diphtheria bacilli had been dried. Conditions were the same as in the previous series of experiments. The second series of experiments was undertaken with a view of finding out the relation between the amount of gas generated and the amount of sterilization accomplished. It was claimed that small amounts of the material would accomplish the same results as larger amounts, and some tests were made with this in view. Some twenty-one rooms were used. The tests were entirely for superficial disinfection; and the test threads were placed in various portions of the rooms, on the floor, mantles, etc.

The following is a summary of the results in some of the experiments made during October, November, and December. The results are simply an average of the amount of the gas that was used in the various rooms.

I. 5 ounces to 1,000 cubic feet; 12 diphtheria threads. Result: growth in every case.

II. 6 ounces to 1,000 cubic feet; 12 diphtheria threads. Result: growth in every case.

III. 9 ounces to 1,000 cubic feet; 9 gauze strips. Sterile, 1; growth, 8 to 6 were of non-pathogenic organisms.

IV. 10 ounces to 1,000 cubic feet; 5 diphtheria threads. Sterile, 1; growth, 4.

V. 11 ounces to 1,000 cubic feet; 7 diphtheria threads. Growth in every case.

VI. 11¼ ounces to 1,000 cubic feet; 5 diphtheria threads. Growth in every case.

VII. 11½ ounces to 1,000 cubic feet; 10 diphtheria threads. Sterile, 9; growth, 1.
VIII. 12 ounces to 1,000 cubic feet; 8 diphtheria threads. Sterile, 2; growth, 6.
IX. 14 ounces to 1,000 cubic feet; 8 diphtheria threads. Sterile, 7; growth, 1.
X. 13 ounces to 1,000 cubic feet; 8 diphtheria threads. 2, sterile; 6, growth.
XI. 18 ounces to 1,000 cubic feet; 5 diphtheria threads. Sterile, 4; growth, 1.
XII. 19 ounces to 1,000 cubic feet; 6 diphtheria threads. Growth in every case.

Several tests were then made by increasing the amount to about 30 ounces to 1,000 cubic feet, with the result that sterilization was accomplished in practically every instance. The only exceptions were in two instances, where, with an average of 30 ounces to the 1,000 cubic feet, the results failed to be satisfactory. As these two cases were performed on very cold days, when the temperature was below 35 degrees Fahrenheit, the only inference that could be drawn was that the temperature had considerable action on the gas, as the other conditions were the same. The influence of the temperature appears to me to have considerable influence on the action of the gas. During the summer there was a good result, with larger amount in every case in rooms of the same character as in the fall. The only conclusion that can be drawn from these experiments is that under 11 ounces to the 1,000 cubic feet the action of the gas is very inefficient. From 11 to 20 ounces to the 1,000 cubic feet the results are very unstable, sometimes satisfactory and sometimes the reverse. With larger amounts the results are far more constant. The fact that the results with the same amounts with different observers differ so much may depend on three factors: (1) the amount of leakage; (2) the influence of temperature; (3) the relative amount of humidity or moisture.

The settlement of these three questions will very much increase our knowledge on the properties of formaldehyde. So far as our experience goes, we would draw the following general conclusions from our experience with formaldehyde.

(1) That formaldehyde gas is a very efficient and practical germicide for superficial disinfection.

(2) That its penetrating power under ordinary conditions is very slight. For deep penetration it has practically no value.

(3) That larger amounts give much more constant and satisfactory results than small amounts.

(4) That, other things being equal, the gas acts better at fairly high temperatures than at low. It also apparently gives better results in warm, dry rooms than in those that are cold and damp.

(5) That its action does not seem to depend on the length of exposure. In five hours' exposure the results were the same as for a longer period.

It may be here noticed, in conclusion, that the gas is not so innocuous to animal life as some writers have stated. While no experiments were made with this in view, it was observed that all the flies were invariably killed, and generally the bed-bugs. One dog and two cats, which were accidentally left in the rooms of different houses, and exposed to the action of the gas, were found dead when the rooms were opened.

THE PRESIDENT.— We shall be very glad to hear from Professor Harrington.

PROFESSOR CHARLES HARRINGTON.— Mr. President, I have done in the past few months more or less in the way of experimenting with formaldehyde, using it in different forms and with different lamps. My experience is that very much depends upon the conditions of the room,— that it is not so much how much formalin is used or how many pastils of formalin, but how much ventilation is going on all the time. But, experimenting in practically air-tight chambers, I found that three ounces of a 40 per cent. formalin solution will kill any kind of bacteria that are exposed in two hours and a half, and with larger amounts bringing it down to fifteen minutes and thirty minutes. But that is all in an enclosed space where ventilation does not occur. I experimented first in a room of 7,500 feet capacity, where night and day natural ventilation went on, and used about two quarts of formalin, and left the room for twenty-four hours. At the expiration of that time almost everything that had been put in as a test object where exposed was killed, and a test culture taken from parts of the room,— in the cracks and floor,— in addition to the bacteria that I introduced myself, was killed; but, then, substances

which were protected and substances that were moist escaped very largely. Then I went into another room of over 10,000 cubic feet capacity, and used pretty nearly four quarts of formalin, of 40 per cent. formalin, and left the room locked for the same length of time, — twenty-four hours; and in the morning so much ventilation had gone on, in spite of the fact that every ventilating outlet had been closed, that there was no trouble at all on entering the room. In other words, most of the formaldehyde had escaped, and only two or three of the test objects that had been introduced were killed. I repeated that experiment in a small room where there was opportunity for natural ventilation, by reason of the fact that a lot of steam-pipes went through it, which raised the temperature of the room very much, and with the same experience there, and then experimenting in other rooms that were closed with double windows, and only a single door, which could be stopped with a wad of cotton at the bottom, with gum labels pasted over the keyholes, and got results which were practically the same as those in a glass cabinet. And, from all the experiments which I carried out, I came to the conclusion that formaldehyde was a first-rate disinfectant for the service of disinfection, but not for any penetrating effect. It will penetrate in some instances; but its action in this way is such that one can hardly say the chances are so great that it will not penetrate that it can hardly be safely used with the idea that it will penetrate. I did succeed in killing typhoid and streptococcus inside the mattress; but with the same organisms were imperfect spores, very highly non-resistant, pathologically considered, and they were killed, although side by side with the other organisms. And we succeeded in killing these same organisms on paper enclosed in cotton bags, using cotton such as is employed in making flour-bags, which is pretty full size; but even then we were not always successful in killing them. So that still further confirmed me in the opinion that it was not a good penetrating disinfectant. I used all sorts of lamps. The lamp of the Sanitary Construction Company seemed to me rather faulty, in that the tube was so likely to clog; and, also, it takes such a long time to disseminate the gas. I think I got my best results with the formaldehyde in pastils, using the Schering lamp. It seems to me that that method has the advantage over the other, in that it is very

simple to apply. I do not think that it can be applied with danger from fire, because it is nothing but an alcohol lamp. The lamp itself is a basket that holds the pastils; is non-inflammable, being made of iron. There is nothing for the lamp to ignite, and it can only act on the pastils. Of course there is a slight possibility of danger, but it is so slight that it seems to me to be disregarded: whereas, in using the autoclaves under pressure, it seems to me, there was more or less danger of possible explosion. Anyway, I know that every time I got through using one without having it explode I felt very much gratified. The advantage, also, in the Schering lamp seems to me to be that, after you have lighted the lamp and shut the door, your work is done, so far as your presence being needed. You light your lamp, shut the door, and go away, and, when the lamp is burned out, the operation ceases: whereas, if you are using an autoclave, you may have to stay by it, or have somebody else, for a matter of two or three hours. The first time I used the Sanitary Construction Company lamps, I began about twelve o'clock and knocked off at six,— and then I had only used about four hundred cubic centimetres,— and started in the next day with the lamp, after it had been properly fixed, and began at twelve, and got through somewhere about seven. And, if a man has a number of places to disinfect. it seems to me the element of time comes in there.

It is true that the pastils are rather expensive. I think they are something like $7 a dozen, and you have to use two for every 35 cubic feet of space; but there is another form of paraformaldehyde which is put on the market that is very much cheaper. It has some imported name which for the moment has escaped me. They are now using it at the City Hospital in place of pastils, and I am informed they get equally good results but for the cost of the pastils.

Then another element of expense is the original cost of the lamp. I suppose that autoclaves will be very much reduced in price, but this lamp that one uses with the Schering pastils costs only $7.50; and there is no particular reason why it should cost more than a dollar, so far as any work involved in its construction is concerned. There is no reason why you cannot use an ordinary lamp, with iron or copper gauze to hold the pastils.

The conditions of moisture certainly play a great part in the success of disinfecting with formaldehyde. I have tried to sterilize surgical dressing. I have taken comparatively dry dressing and pretty moist ones, soaked with pus, side by side, and have killed all the organisms in the dry dressing in a very short time, and have succeeded only in killing those on the very surface of the wet dressing after an exposure of 10, 12, and 24 hours; and I think it is safe to say that, where there is any appreciable amount of moisture, your agent is going to kill only on the surface, and no distance whatever away from it.

I do not know, Mr. President and gentlemen, of anything else that I can suggest at the present time.

THE PRESIDENT.— Dr. Chapin, of Providence, has experimented with and studied this question to some extent. I should be very glad to hear from Dr. Chapin.

DR. CHAPIN.— Mr. President, I cannot add anything to what has been said. I have not been uniformly successful; and, from what has been said this afternoon, I understand pretty well why I have not. It is because I have not used enough formalin. I have used for years the Sanitary Construction apparatus, and found it worked pretty well. Although it does get out of order and get stopped up, we have exercised a little mechanical ingenuity every two or three days to keep it in working order; but I have not used usually more than eight or thirteen ounces per 1,000 cubic feet, and the result has been I have succeeded during that time in sterilizing satisfactorily. I cannot see that the length of the exposure had anything to do with it, but the tightness of the room has a great deal to do with it. If you are going to use that apparatus, it is necessary to put a covering over the door. The keyhole is pretty small, but it is large enough for odor to pass through. Dr. Schwartz has a contrivance to prevent that, which he will show you.

THE PRESIDENT.— We have been looking for Dr. Schwartz. I am glad to hear he has got something for us.

DR. SCHWARTZ.— I feel a little shy on the subject, and did not know I was to be called upon; but I suppose what Dr. Chapin refers to is a screw-driver, very small in size,— a very useful utensil

to carry in the pocket. With it you come to the keyhole, and screw in the door-knob; and, I suppose, pull the door inward or remove the door-knob without making a hole in the door.

THE PRESIDENT.— These papers are open to general remarks and discussion. It is one of the most interesting subjects that we could have brought before the Association, and one about which we are asked more questions than almost any other. I hope that members of the boards of health who have questions to ask will now ask them, so that gentlemen who are competent to answer may favor those gentlemen with their answers.

MR. BRIMBLECOM.— Mr. President, I would like to ask Dr. Brough if any record of any of the tests was made as to the consequence after seventy-two hours had expired.

DR. BROUGH.— Yes, I got them all.

MR. BRIMBLECOM.— Were they examined?

DR. BROUGH.— Examined those which were kept for about two weeks or ten days. Those that were sterilized had no growth. Occasionally, we have a growth of mould, nothing more.

MR. BRIMBLECOM.— I wanted to make that point clear, because we found at Newton that cultures that were sterilized at the end of three days sometimes had a growth at the end of six days.

THE PRESIDENT.— Have any other gentlemen any other questions to ask or any other remarks to make? There must be those here who have experimented with this disinfecting agent, and I know that there are a great many here who want to ask questions about it. Mr. Taylor, wouldn't you like to make some remarks concerning any defects that have been mentioned?

MR. TAYLOR.— No more than to say we have simply the improved apparatus, and have overcome most of those defects. I do not think perhaps I had better say anything.

THE PRESIDENT.— I will call on Dr. Brough to close the discussion.

DR. BROUGH.— I have nothing to say, except, when we used the machines, it usually took about an hour to an hour and ten minutes to get a sufficiently large amount of gas through the keyhole. We now use the Sanitary Construction apparatus, and we usually have twenty-five to thirty ounces an hour pass through the keyhole when

used. As regards the difference between wet cultures and dry cultures, I see Dr. Parks and some men in New York have had experiments with them, and they claim the gas would act a great deal more easily on wet cultures than it would on dry; but my experience has only been with dry cultures. I do not use wet at all.

PROFESSOR HARRINGTON.— Mr. President, in all the experiments that I made, using cultures, they were always wet; and I think they are more difficult to kill than dry. But what I mean in speaking of wet dressing is there is a chance for gas to penetrate, if wet, and to get at the organisms under the surface; and that would not do it, but, when they are dry, I think it might.

There is one other thing I wanted to speak of; and that is the use of calcium chloride with the formalin as recommended with the French autoclaves. I understand that they advocate the use of calcium chloride to prevent the formalin from being polymerised; but it does not prevent it. If you boil a little formalin with a small piece of chloride calcium, it will all polymerise, and I do not quite see the sense of using it in the machine.

THE PRESIDENT.— I would like to ask Professor Harrington if he has used the formalin as a disinfectant or tested its value at all by evaporation in closed rooms?

PROFESSOR HARRINGTON.— Yes, I did that in one instance by diluting formalin with water, and then boiling it cautiously. I could get rid of every bit of it without polymerisation; and it seems to me possible, therefore, to apply that on a large scale. I have mixed four litres of formalin with three of water, and put the mixture in a copper tank holding about ten litres, and then boiled it with a gas stove; and the next day, when I opened the room, I found in the tank, — of course, I had to have some means of shutting it off and knowing how much there was left in the tank, so I had a glass gauge, and could see from the transmitter how high it was, and, when it showed me it was down to the bottom of the gauge, I shut off the gas. Then the next day I went in, and found a little over a quart left in the tank; and it was rather mushy from the polymerised formaldehyde. I attempted to determine how much had been formed; but I could not get a filter, and threw it all into the funnel with a larger filter paper, and let it drain off, and when it had stopped,— I do not

know who weighed it,— but the mass weighed a little over a pound; and then I put it into a covered dish, and let it stand to see if it would spread any more, and from day to day I could remove a few drams of liquid, and then it gradually got down to a few ounces. Then I left the cover of this dish off; and it all hardened up, the mass weighing perhaps an ounce.

MR. TAYLOR.— When polymerised, about 70 per cent. of it had evaporated?

DR. HARRINGTON.— Yes, sir.

THE PRESIDENT.— I was induced to ask this question from the fact of my wondering whether this 40 per cent. solution had any value as a germicide evaporated in a room; and this occurred to me, having observed its deodorizing effect under severe conditions,— a patient in quarantine in whom a necrosis of tissue was going on very rapidly, and in the presence of which you could scarcely breathe, the odor was so very bad. I directed the placing of a saucer, filled with the 40 per cent. solution of formalin, under the bed, when diluted so that the patient could bear it. It was continued; and this odor, which was so unbearable all over the room, was completely dissipated. It was the most wonderful effect I ever observed, and I was wondering whether any experiments had been made to see whether it had any germicidal action under those conditions.

PROFESSOR HARRINGTON.— I think Dr. Doughty in New York did some work in that way. He put the formalin in open dishes in the room before he undertook his experiment, and he found that it did have germicidal action; but it was so comparatively slight that he felt that he could not recommend it.

A MEMBER.— I should like to ask, Mr. President, if any one has made any experiment with spraying formaldehyde, and using it in that manner,— a method that has been recommended.

THE PRESIDENT.— Has any one had any experience in spraying a 40 per cent. solution of formaldehyde?

MR. TAYLOR.— That has been used in Philadelphia, advocated by Dr. Abbott; but I believe it has been abandoned.

A MEMBER.— Mr. President, I can report one case of an extreme nature where a very weak solution of formaldehyde was used by the

ordinary spraying apparatus, destroying the whole matter at once. It was used with great success.

THE PRESIDENT.— Are there any more remarks to be made on the subject? One gentleman has gone whom I hoped to ask to say something concerning our next meeting. I presume our next meeting will be held at Mr. Ellis's farm in April. If there is no further business to come before the meeting, a motion to adjourn will be in order.

Adjourned.

PUBLISHERS' DEPARTMENT AND BOOK NOTES.

In this department the publishers will include notices of such subjects, germane to the scope of the *Journal*, as would seem to be of interest to its readers, but which are not a part of the transactions of the Association.

BOOK NOTES.

Among recent publications, one of particular interest in the present war crisis is *The Wound Dresser* (Boston: Small, Maynard & Co.). This book is a series of letters written during the war of the rebellion by Walt Whitman, while he was in the hospitals at Washington, voluntarily devoting himself to that work of humanity which is now so well known. Written without the idea of future publication, these letters are faithful and graphic accounts of daily scenes among the sick and wounded.

In the first flood of patriotic enthusiasm, we are all too prone to forget that war means more than martial display and achievement,— that it means also the pathos of suffering and death; and this is a phase of the question which humanity demands that we keep constantly before us. *The Wound Dresser* is of peculiar interest and value in throwing side-lights upon such important matters as the inadequacy of the old war hospitals, the sad lack of equipment, the neglect of subordinates, and the untiring, unselfish, and sympathetic efforts of the surgeons. It may fairly be called a contribution, not only to general literature, but to the authentic records of the progress of military

surgery. It is a layman who writes, to be sure; but the modern surgeon, reading his words, will perhaps value them all the more highly on account of the novel and unexpected lights which they throw upon the methods of relieving disease and wounds in times of extreme stress and danger.

Polk's *Medical and Surgical Register of the United States and Canada* is now undergoing its fifth revision. Physicians who have not given their names to the canvassers are urged to report to headquarters at once, giving full information. Address, R. L. Polk & Co., Detroit, Mich.

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[The Association as a body is not responsible for statements or opinions of any of its members.]

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APRIL MEETING

OF THE

Massachusetts Association of Boards of Health.

The quarterly meeting of the Massachusetts Association of Boards of Health was held at the Woodland Park Hotel, Auburndale, Mass., on the afternoon of Thursday, April 28, 1898, the Association being the guests of Mr. George H. Ellis. The Vice-President, Dr. S. H. Durgin, was in the chair. After the dinner the proceedings were as follows: —

THE CHAIRMAN.— I am sorry to interrupt you at this point, calling you from refreshment to labor; but our time is very short this afternoon, and we must hasten to our work. The Executive Committee recommends for membership in the Association the following candidates: —

DR. J. T. BULLARD	New Bedford.
DR. C. ASHLEY	New Bedford.
DR. W. F. HOLMES	Somerville.
DR. H. L. BELDEN	Gloucester.
DR. EVERETT D. HOOPER	Boston.
DR. HIBBERT W. HILL	Boston.

Those in favor of the election of these gentlemen as members of the Association say aye; contrary-minded, no. It is so voted.

We will now listen to the reading of the records of the last meeting by the Secretary.

The records of the last meeting were here read by the Secretary.

THE CHAIRMAN.— Are there any corrections to be made in the records as read? If not, they will stand as the records of the Association.

For want of time, we will omit action on the proposed amendments of the constitution until the next meeting.

Is there any miscellaneous business to be brought before the meeting? If not, we will proceed at once to the paper by Dr. T. B. Shea on "Proper Isolation of Infectious Diseases."

PROPER ISOLATION OF INFECTIOUS DISEASES.

BY THOMAS B. SHEA, M.D.

Proper isolation of infectious diseases is one of great importance to a well-organized health department. For proper isolation it is necessary: first, to have a well-equipped hospital having not only the confidence of the public, but also of the profession at large; second, prompt investigation of cases, when reported, and immediate action. Up to three years ago our department was unable to fulfil these conditions; and, as a result, the proper isolation of infectious diseases was an impossibility.

The conditions then existing and the present ones are, I am happy to state, entirely different.

The hospital in Boston to take care of infectious diseases, especially scarlet fever and diphtheria, is a branch of the Boston City Hospital, known as the South Department, which is entirely distinct and separate from the main hospital, and under the charge of Dr. J. H. McCollom, formerly city physician of Boston. It has a capacity of 224 beds; and since it has been opened, during the past

three years, it has happened occasionally that they have had to refuse cases for the reason that every bed has been occupied. That in itself is, I think, a sufficient recommendation concerning the efficiency and management of the hospital. Therefore, in a hospital such as I have described, it is possible to isolate infectious diseases. What is isolation? I think I cannot better describe its meaning and significance than reading to you a circular published by our Health Department, July 1, 1895: —

CITY OF BOSTON.

HEALTH DEPARTMENT, July 1, 1895.

At a meeting of the Board of Health this day the following regulation was adopted: —

1. Whoever is infected with small-pox, scarlet fever, diphtheria, or membranous croup, shall immediately proceed to some isolated place or room designated by the Board of Health; and no person who has been so affected shall leave such place or room, and no article shall be removed from such place or room, until the Board of Health shall certify in writing that all danger of communicating such disease to others is passed.

2. Every parent or guardian of any child or ward infected with small-pox, scarlet fever, diphtheria, or membranous croup, shall immediately cause such child or ward to be conveyed to some isolated place or room approved by the Board of Health; and no parent or guardian shall permit such child or ward to remove from such place or room until the Board of Health shall find and certify in writing that all danger of communicating such disease to others has passed.

3. No person other than the attending physician, nurse, and agents of the Board of Health, shall enter any apartment or other place set apart for the treatment of small-pox, scarlet fever, diphtheria, or membranous croup until the Board of Health shall certify in writing that such apartment or place has been satisfactorily disinfected.

4. No person having the care of any other person who has been affected with small-pox, scarlet fever, diphtheria, or membranous croup, shall advise or permit such other person to leave any place designated by the Board of Health as a place of isolation of such infected person before said Board of Health shall have certified in writing that such person can leave such designated place without danger to others.

5. No physician who has been in attendance upon any person who has been infected with small-pox, scarlet fever, diphtheria, or membranous croup, shall advise or knowingly permit such person to leave any place designated by the Board of Health as a place of isolation of such infected person before said Board

of Health shall have certified in writing that such infected person can leave such place without danger to others.

By isolation the Board of Health means complete and continued separation of the patient from all other persons, except the attending physician and nurse, from the beginning of the illness until disinfection has been done and the written release from the Board of Health delivered to the patient or those having the patient in charge. In all cases of doubt the patient should be placed in isolation until such time as the attending physician, using all available means, may ascertain the evidence of contagion or infection, and then be immediately reported to the Board of Health. In cases of diphtheria and membranous croup there must be at least two negative cultures reported by the bacteriologist, and in cases of scarlet fever all desquamation from the fever must have ceased, and this fact reported by the district agent, before disinfection will be done or the discharge of the patient be authorized by the Board of Health. The reason and necessity for this will be apparent to all physicians.

At this time was put in operation this method of isolation of cases, especially diphtheria and scarlet fever; and I think sufficient time has elapsed to determine some of the beneficial results that have followed. A few years ago I addressed this Association at Gallop's Island, and at that time outlined the plan of our department for dealing with this question.

For the benefit of the new members and those that were absent at that time, I will briefly describe our methods.

The city is divided into fifty districts. To each is assigned a doctor known as the local medical agent. When a case of diphtheria or scarlet fever is reported, he must visit the case, and report whether or not the case is properly isolated; and this report, I might say, to be of any value, must be made immediately within twenty-four hours. These officers also maintain a medical supervision over the schools, public and private, visiting each and every school at least once a day, and examining, when requested, any children that may be in need of their services. Of course, much reliance must be placed upon this particular corps of officers. I think each and every one of them have the proper ideas what constitutes isolation as interpreted by the department, and their reports confirm it.

To maintain the standard of isolation that I have described means that a great many cases must necessarily be sent to the hospital. It is useless to attempt to isolate many patients in their own homes, for the simple reason that the patient or the family have not the means or facilities to carry out the regulations governing these cases. Cases occurring in hotels, boarding-houses, apartments, and tenement houses, necessarily must be sent to the hospital, as it is impossible to isolate these cases for the reason that persons from infected families necessarily have to use the same halls and elevators in boarding and lodging houses, the same bath-room; and there is an intimate connection with the public dining-room.

Therefore, such cases surrounded with the conditions I have described, you can readily understand why they should be sent to the hospital.

But, you might say, persons and heads of families have an antipathy to sending their children to the hospital. Well, if they cannot appreciate the benefits to be derived, not only to themselves, but also to the rest of the community, the only remedy is to take them; and this we have never hesitated to do in Boston, when the occasion demanded it. In the beginning we had more or less trouble in insisting on this method of isolation. The removals were more in the nature of forcible than voluntary ones. Our officers have been assaulted, and we have had to defend vexatious lawsuits. But all these conditions, I am happy to state, have changed. The people have faith in the hospital and its management; and they recognize the advantages to be derived, not only to themselves, but to their children. The physicians themselves, when called to a case of diphtheria or scarlet fever, knowing as they do the standard of isolation we have set to govern these cases, advise and urge that cases be sent to the hospital.

A prompt removal of the patient, efficient disinfection, a raising of quarantine, the readmission to school,— all these, and many more, are the advantages to be derived. That you might understand of what importance a case of scarlet fever or diphtheria means to children of school age occurring in the same building, I asked our inspectors to furnish me with some data. They report as follows: —

District 1.	One	tenement	house;	8	children	attend	school.
District 4.	"	"	"	22	"	"	"
District 5.	"	"	"	8	"	"	"
District 6.	"	"	"	21	"	"	"
District 8.	Three	tenement	houses;	21	"	"	"
District 9.	Two	"	"	19	"	"	"
District 11.	"	"	"	25	"	"	"
District 12.	One	tenement	house;	7	"	"	"
District 13.	"	"	"	12	"	"	"
District 15.	"	"	"	42	"	"	"
District 16.	"	"	"	12	"	"	"

This shows that a case occurring and not sent to the hospital means the exclusion of children from school for a period of two to three weeks in diphtheria and eight to ten weeks in scarlet fever.

Again, there is a custom prevailing in Boston that is not generally understood by the public at large. In the large stores and those especially that employ a large number of help, exclude from their employ persons coming from infected houses.

Such, gentlemen, is the plan and method of the Health Department of Boston in dealing with this question. That the results have been of great advantage, not only to the department, but also to the public at large, are without question. We have had a diminished mortality from scarlet fever and diphtheria, also a great reduction in the number of reported cases. In diphtheria, anti-toxine has received the credit for this decrease in mortality; but I think isolation of the cases must be considered also. In scarlet fever especially, although the type of the disease for the past few years has been very mild, hospital treatment for these cases are of inestimable value. Again, the medical supervision of schools has been a great factor in our work. Heretofore it was not an uncommon occurrence to be consulted by the members of the School Committee on the advisability of closing certain schools on account of an outbreak of diphtheria or scarlet fever. We always discouraged such procedure and for this reason: the only question to be solved was removing the source of infection, which could be easily accomplished by making a visit to that particular school, sending the children home that were infected, and then efficient disinfection. The last epidemic of this character that was brought to my attention happened about eight

months ago. Immediately after the opening of the schools I found in a particular section of the city an unusual number of cases being reported of scarlet fever. We started an investigation immediately in conjunction with the local medical agent. What was the result? After the examination of the schools in that district we found twenty cases of scarlet fever in different stages. These children were sent home, isolated, the school-houses disinfected, and that was the end of that particular epidemic. You might ask how was it possible under our system of inspection for the children to be in school, and it seems to me a very pertinent question. During the past summer the type of the disease was especially mild. These particular children never had the services of a physician. Consequently, the cases were never reported, and at the opening of the school presented themselves for admission.

Speaking of the medical supervision of schools, I would say it was first adopted three years ago under the auspices of the Boston Board of Health. Since then it has been adopted by many of the towns and cities of this Commonwealth, by many of the large cities of the United States, and, as I have been informed, by some of the cities in the Old World.

Gentlemen of this Association, representing, as you do, the different cities and towns of this Commonwealth, I think there can be no greater work that boards of health can engage in than the suppression of infectious diseases, especially diphtheria and scarlet fever, and no work that will be attended with better results, as it means the saving of many precious lives.

The Chairman.— The paper by Dr. Shea is now open for discussion; and I hope we may hear from officers who have come from different cities in the Commonwealth, and that, with very brief remarks, we may learn what is being done in the way of enforcement of isolation. We should be glad to hear from Dr. Chapin, of Providence.

Dr. C. V. Chapin.— Mr. President, I am sorry to say that we do not do so well in Providence as they do in Boston. The chief difficulty in Providence in isolating cases of contagious diseases is

the opposition of the physicians,— the best physicians as well as the poorest. The Health Department has to keep up a running fight with them all the time. They do not believe in keeping diphtheria and scarlet fever isolated. We cannot keep them isolated as we would like to. We cannot get but one culture in cases of diphtheria, and it is pretty hard to get that.

There is one thing that we do in Providence that Dr. Shea did not speak of, which, I am satisfied; is a very excellent thing, and which we are enabled to do now very generally; and that is, in cases of diphtheria we take cultures from the members of the family when the case is first reported,— all the members of the family who expect to leave the house have to have a culture taken from them. And then, again, at the end of the disease, not only does the patient, but every one else in the family, have to have a culture taken. In that way we find a great many infected persons who are perfectly well; and I am satisfied from my experience that, if they were allowed to go abroad free, they would spread the disease.

The Chairman.— Dr. Chapin is very complimentary to Boston and very modest concerning Providence; but he has already betrayed the fact that Providence is ahead of Boston in the way of taking these cultures. I would like to ask Dr. Chapin what is done with those well members of the family who show the bacilli.

Dr. Chapin.— They are treated just exactly as though they were sick in bed. They are obliged to stay in the house or go to the hospital; that is, if we can make them. The cases we have found are not very numerous. It is very seldom that working people are found with the germ present. It is those who have been brought into intimate contact with the sick one, either little children of the same age or the mother,— occasionally the father or older members of the family, but very rarely.

The Chairman.— It strikes me as an extreme but good method to pursue. I should like to hear from other members of the Association as to how far such a course would be approved. We should like to hear from Dr. Chapin, of Springfield.

Dr. W. H. Chapin.— Springfield is in a transition State just now. We have a bill in the city council, which will probably pass this week, appropriating money for the building of a hospital for con-

tagious diseases, to accommodate twenty patients, perhaps. We have under discussion the inspection of schools, but it does not seem so important in Springfield as it would in Boston on account of the less frequency of contagious diseases and the character of the tenement houses. We have just employed a bacteriologist, and he is taking cultures; and we expect very soon to be as cultured as Boston.

THE CHAIRMAN.— Shall we hear from Brockton, Mr. Carey?

MR. CHARLES H. CAREY.— Mr. President, we have had very few cases of contagious diseases in Brockton for the last six months, I think not more than four or five, and those very light cases. I would say that we isolate them as well as we can. We have no hospital, and we feel in need of that very much. The Board of Health has advocated it, but the city government has not seen fit to give us one as yet. We have been supplied with an apparatus for the use of aldehyde gas, but we have had but a few occasions to use it. We have not been so free from contagious diseases for the past twelve years as we have for the past six months.

THE CHAIRMAN.— Shall we hear from Lowell?

DR. JAMES B. FIELD.— I see you look at me, Mr. Chairman; but I am very glad to say I am not a member of the Board of Health of Lowell just at the present time, for the city council has made a recommendation that a clean sweep shall be made in the *personnel* of the Board of Health. The only person we have there is a bacteriologist, who is here to-day and can speak for himself. In other respects we are far behind Boston; and, if I were on the Board of Health, I should want to hide my head.

THE CHAIRMAN.— Shall we hear from Dr. Gage, of Lowell?

DR. J. ARTHUR GAGE.— I should like to add a word. This is what I find in Lowell. Since getting through with the Board of Health, I have had a case of scarlet fever, and I tried to find out where it came from; but it was reported that there were no cases of scarlet fever, and I found that some of the physicians were reporting the cases as German measles. We haven't any hospital advantages, excepting one hospital, that has a few beds where the city can take a few cases at a rather high rate of board. The city will not build a hospital, and there is no board of health; and the contagious children go to school, and they are not isolated, and the cases are not reported,

and we are in a general state of chaos. I should like to inquire in regard to the expense here. Is it borne by the city generally or is it free?

THE CHAIRMAN.— It is borne first by the city; but, if we find a patient who is able to pay, we collect from him. If such patient is poor and not a resident of Boston, and is a resident of some town in the Commonwealth, then we can collect from such town; but, if he is from without the Commonwealth, then we can collect.

DR. PRESCOTT. — From the State?

THE CHAIRMAN.— Oh, yes, in that case we can collect from the Commonwealth.

DR. PRESCOTT.— It is a very small collection, only three dollars and a half from the Commonwealth, and then only from the time they are entered until they are able to be moved. That is little enough.

THE CHAIRMAN.— There was an old law, not perhaps now in force, which we used to exercise years ago, by which we were authorized to collect from the Commonwealth, and also from any town where the patient had a legal settlement, the reasonable expenses which the Board of Health was put to in the care of such cases. I remember in 1873, in our great epidemic of small-pox, we collected in some cases, I think, as high as $20 to $30 dollars per day; and those very large bills were allowed by the Commonwealth. At that time we collected, as the result of that epidemic, for the city of Boston something over $90,000.

DR. PRESCOTT.— Then at the city hospital there is a man who investigates the settlement of every patient who is admitted; and, if he has a settlement in any city or town in the State, they charge that city or town $1 a day. If he has no settlement, he is charged to the State. They have an agent who goes around; and, when the agent thinks he can be moved to Tewksbury, he is so moved, and the case is stricken off the city's book and the city is not allowed to charge the State except from the time the patient was admitted to the hospital until the city receives notice in regard to his removal. And, when he was at the hospital, the charge was about $3 or $3.25 a week, and the cost was over $10 a week.

THE CHAIRMAN.— Shall we hear from Fall River?

DR. CHARLES A. HICKS.— Mr. President, we have been having

very little contagion in Fall River. We had only 25 cases of diphtheria last year, and there were only 125 cultures taken in all. Our cases of mortality, I think, were very high,— I think something like 30 per cent. I don't fairly understand it. The physicians there are using anti-toxine very generally, but I think the trouble is that we are not using it early enough. In the matter of isolation, it is not so perfect as it is in Boston, inasmuch as we haven't a contagious hospital. The isolation among certain classes is carried out very perfectly. In tenement houses it is not so perfectly carried out, and without a hospital we find it almost impossible to carry out isolation to any great degree. While I think, on the whole, we are doing perhaps as much as any city in the Commonwealth in that direction, there is room for vast improvement. There is one question I should like to ask in regard to the methods in Boston. How long after the removal of a case in tenement houses,— how long afterward are the remaining children allowed to attend school?

THE CHAIRMAN.— The law fixes that at two weeks after the death, removal, or recovery of the last case.

DR. HICKS.— That is the method we follow there.

THE CHAIRMAN.— We should be glad to know what is done in the city of Newton in regard to isolation and any difficulties arising in its enforcement. Shall we hear from Dr. Curtis?

DR. FRANCIS G. CURTIS.— Mr. Chairman, we have here in Newton a small hospital for contagious diseases, both diphtheria and scarlet fever; and I think that the greater number, or perhaps between 30 and 40 per cent. of our cases of contagious diseases, are sent to the hospital, so we have very little difficulty in isolation. The city appropriates a certain amount of money every year to pay the expenses of the care of these cases at the hospital. So we are able to state to the parents of the children that we can take them up there, and take care of them with very little expense to them. Of course, if they are able to pay, the hospital collects. Otherwise the city has borne the expense.

THE CHAIRMAN.— We have with us this afternoon one new member who has observed the workings of the health departments of several of our cities in this country, and we shall be glad to hear from him in this line,—Dr. Hill of Boston, Director of the Laboratory of the Board of Health.

Dr. Hibbert Hill.— Mr. President, the point that strikes me particularly here is with regard to the infection of healthy persons who come in contact with a person unavoidably during the progress of a case of diphtheria. That was brought up by the first gentleman who spoke, and it seems to me a matter of considerable importance. Although I don't remember any work done on that special point in Brooklyn, I know of a great deal of work that was done in Philadelphia; and I had proof of those persons who came in contact with persons that they were found to have diphtheritic germs in the throat. That leads me to think that either the persons so infected may themselves develop the trouble or they may infect others with whom they come in contact afterward without actually developing a case themselves. It is a great problem to know what to do with these people, because there are a large number — I have forgotten the exact percentage — of persons who come in contact with such persons who receive the bacteria. It is rather a problem for the laboratory side, and it gives me great pleasure to leave it with the present Association to settle.

The Chairman.— Not being able to recognize every one who is filled with a desire to speak on this subject, I will call for any one who would like to discuss the paper which has been read. Dr. Abbott.

Dr. S. W. Abbott.— Mr. Chairman, Dr. Shea's paper is one of unusual importance and value to this Association, because it treats of the topic which, to my mind, is the most important of all to local boards of health. The management and control of infectious diseases constitute unquestionably the highest and most important duty of such boards; and, among the many different measures employed for the prevention of disease, isolation stands first of all. The prevention of infectious disease is, in fact, a warfare,— not merely a warfare of to-day or to-morrow, but one which is always going on. The Germans use a very expressive term for this purpose; that is to say, the *campaign* against infection.

The isolation hospital is one of the more recent methods employed in this country, and a very effective one for carrying out this purpose. It has reached its highest perfection in Great Britain, where there are now at least four or five hundred such establishments; and

almost every city and town of seven or eight thousand inhabitants has such an institution.

In Massachusetts, so far as I can learn, there are now existing or under way such hospitals in the following cities: Boston, Lynn, Worcester, Newton, Brookline, Waltham, and Springfield.

It may be proper here for me to allude to the marked differences which are peculiar to the different infectious diseases with reference to the necessity of isolation.

That the spread of such diseases is due to the close contact of people is shown by the following figures. If we divide the State into two classes or districts,— the densely and the sparsely settled districts,— we shall find the following facts to be true: that for every 1,000 deaths from consumption in the dense districts there were 727 in the sparse districts; for every 1,000 cases of diphtheria in the dense there were 634 in the sparse districts; of scarlet fever, 1,000 in the dense to 587 in the sparse districts; of measles, 1,000 in the dense to 445 in the sparse districts; of small-pox, 1,000 in the dense and only 149 in the sparse district, small-pox being, in fact, the most contagious of all known diseases.

This goes to show that in the sparse district people are already isolated in a considerable degree by the very fact of their distance from each other.

These figures are the result of observation upon about 200,000 deaths from the diseases to which I have referred.

Typhoid fever, on the other hand, does not appear to be subject to the same laws, since the method of its spread is entirely different from that of the other diseases; and in this case we have 1,000 deaths in the dense district to 1,175 in the sparse.

A very good reason for the employment of infectious disease hospitals consists in the inability of the working class to furnish accommodation for the isolation of the members of their families who may become ill with infectious disease. Such families usually live in tenements having from one to four rooms, none of which can safely be devoted to the treatment and isolation of infectious diseases of a dangerous character. The serious overcrowding which prevails in some of the large cities of Great Britain has not yet been reached in any of our large cities, but the tendency is in that direction. (Glasgow has a population of more than 100,000 living in one-room tenements.) The very great increase of the population of this class by immigration has been the chief factor in causing overcrowding in our cities during the past decade.

Another important advantage secured by the isolating hospital is found in the fact that the ordinary duties of the household, the attendance at school, and especially the support of the family by its wage-earners, can be carried on without disturbance, the danger of infection having been removed by the transfer of the sick member of the family to the hospital. It has not unfrequently happened that the local sanitary authorities in some of our cities and towns have not only rigorously enforced the law relating to non-attendance at school, but have also quarantined the whole family, old and young, so that by this means the scholar is deprived of from two to ten weeks, or even more, of his educational privileges at the most important or most receptive period of his life, the length of time depending upon the duration of illness in the infected household. And, more than this, the father and other wage-earners have been kept from work in the mill, the factory, or the workshop. Even if he is allowed to work, his fellow-workmen are wont to regard him with suspicion so long as a case of any one of the infectious fevers exists in his household. Now the prompt removal of such cases permits the school attendance and the employment of other members of the family to go on undisturbed.

In all my experience with local boards of health during the past few years I know of no circumstance or condition which has given more serious trouble and perplexity than this; nor do I know of any which is likely to be relieved to so great an extent as is this condition by the introduction of the isolating hospital.—*Twenty-fifth Annual Report of State Board of Health of Massachusetts, p. 692.*

Allow me to quote still further from the same volume, page 704: —

Let us for a moment consider a practical illustration of such a system as I have outlined: A father, mother, and four small children, the latter aged two, four, six, and nine years, occupy a tenement of two rooms, including a kitchen and sleeping-room, each about twelve feet square and seven and a half or eight feet high. The kitchen is the cooking and living room of the family, and both are heated by the kitchen stove. The sleeping-room is occupied at night by the whole family; and, after allowing for the space taken by the furniture, there are in this room about 175 cubic feet of air-space only to each person, which is doubled by the open door into the kitchen. The sleeping-room has but one window, which in winter is kept constantly closed; and there are no special means for ventilation. I am not here describing an unusual case, but, on the contrary, one which is of very common occurrence in any one of our large manufacturing cities.

One of these little children is taken ill with diphtheria in its severest form. There is no provision in the city for such cases, and the mother gives the child the best care which she can afford under the circumstances. The neighbors are afraid to take the other children to their homes. The next child is too young to attend school; and the law excludes the older children from school during the prevalence of illness in the family, thus making their exposure to infection more certain. After days of weary watching another child falls ill; and then perhaps

the mother herself, worn with care and solicitude for her little ones, becomes a victim to the disease. Meanwhile the youngest has died, and is laid out for burial in a corner of the kitchen, the living-room of the family.

Dr. Russell, the health officer of Glasgow, in commenting upon such cases, which, in a crowded city like Glasgow, were once of very frequent occurrence, says, when contrasting the condition of the rich and of the poor: —

"Last of all, when *you* die, *you* still have one room to yourself, where in decency you may be washed and dressed and laid out for burial. If that one room were your house, what a ghastly intrusion you would be! The bed on which you lie is wanted for the accommodation of the living. The table at which your children ought to sit must bear your coffin, and they must keep your unwelcome company. Day and night you lie there until with difficulty those who carry you out thread their tortuous way along the dark lobby and down the narrow stair through a crowd of women and children. You are driven along the busy and unsympathetic streets, lumbering beneath the vehicle which conveys your scanty company to the distant and cheerless cemetery, where the acrid and deadly air of the city in which you lived will still blow over you, and prevent even a blade of grass from growing over your grave."

Dr. Russell has here graphically described a death among the abodes of the poor; but, when the death is from infectious disease, the conditions are still worse, since the added danger of infection to the remaining members of the family only doubles the distress of the household. Now for such conditions as I have described the infectious disease hospital provides a most excellent remedy; and, while it may not prevent the occurrence of the first case in the family, it does provide for the taking of the infected person to a suitable place, where he will not only receive far better care himself, but will not transmit the infection to his brothers, his sisters, or to any other person.

In the hospital, too, in place of overcrowded and ill-ventilated bed-chambers, there are large and well-ventilated wards; in place of foul air and darkness, there is fresh air and sunlight; in place of scanty food, and food that is ill adapted to the wants of the sick, there is food selected especially for the case in hand; and, more than all this, there is good nursing and the best of care; and, when the patient has recovered, he is returned to his family, no longer a source of danger and of infection.

In summing up this question, the Local Government Board of England, in a memorandum published in 1890, presents the following advantages to be secured by the establishment of isolation hospitals for infectious diseases: —

1. They allow the complete isolation of the sick in cases where the sick cannot be effectively separated at their homes.

2. The work of the wage-earner, the ordinary duties of the household, and the school attendance of children can go on as usual without interruption.

3. Infection is thus kept by itself in a place where it can be intelligently treated and destroyed. Otherwise, in tenement houses and crowded dwellings, and among those who are ignorant of its nature and its proper management and control, it may spread and cause infinite harm.

4. Cities requiring such hospitals should not wait for the hurried impetus derived from panic, but should construct carefully and thoroughly, and with due regard to their own special needs. Such hospitals, like fire departments, when completed, should be always ready for immediate use. They should be accessible and under wise and intelligent management.

THE CHAIRMAN.— Is there any other gentleman who wants to make any remarks on Dr. Shea's paper? There has been and still is much hesitancy on the part of many boards of health of this Commonwealth in the removal of cases of contagious diseases to the hospital. The more united this Association is upon this subject, the easier it will be for each individual board of health to act; and this is the time when opinions should be expressed, and, if possible, a united feeling upon this question be obtained. It is one of the objects of this Association. I hope every one will express his fullest views as to the approval or disapproval of this method of caring for contagious diseases. There are still a few minutes more. We want to adjourn at four o'clock.

DR. WILLIAM H. PRESCOTT.— Perhaps members of the Association would be glad to hear of the experience which I had as physician to the Home for Little Wanderers in Boston, situated on West Newton Street. It has about one hundred children, as a rule; and last spring we started in with diphtheria. We usually have it about once a year; and last year it came early, and stayed late. We had at least forty cases among the one hundred children. Finally, we made up our minds that the only way to do was to go through all the children and all the people who had anything to do with the children, and take a culture from every throat, and every nose where there was any discharge from the nose. We did that the first time; and we got eight children who had no symptoms whatever of the disease, but had the bacilli of diphtheria in one or the other of the places. Each child, as it was discovered, was sent to the hospital, Dr. McCullum very kindly taking care of the children until they were over the bacilli of diphtheria. We had another case start up; and we went over them again, and got six. In this way we went

through them four times, until finally we reached the point where there were no other cases of diphtheria. There were no cases, so far as I know, among the adults; but they were all among the children. One of them was the little boy who attended the door. He had bacilli in his throat; and the bacilli were found to be virulent, although, so far as you could see, the boy was healthy. It seems to me we cannot be too strict about that.

With reference to taking cultures from other members of the family, Dr. F. H. Williams, of Boston, has done that for several years. I forget just when he started in, but in a number of cases he has found the bacilli in the throats of people who were perfectly well; but they have been isolated and cared for just as if they had been real cases of diphtheria, because, in a way, they are more dangerous to public health than those people who have the disease and are sick. The latter are in bed, and are kept away from others. Diphtheria is not a disease where the germ is in the air, as it is likely to be with measles and scarlet fever; but you have to come in contact with something that has been handled or spat upon by the patient who has had the germs. That has been shown, I think, pretty conclusively by the results in the State hospital, where they have never been able to develop diphtheria on the cultures from bacilli taken in the air; but they have got to find them on the floor, from the shoes of the nurse, the hair of the nurse, and any place that is touched, any part of the furniture, or the handle of the door. So that you could walk through a room where a diphtheria patient was as safely as if you were in the other room, so long as you touched nothing.

THE CHAIRMAN.— Dr. Shea, will you close the discussion with a few words?

DR. SHEA.— I think I covered the subject as well as I could in my paper. There is one thing that Dr. Abbott spoke about that I think is a great factor in this question, especially the virulence of diphtheria. It has been my experience, and especially before we obtained the hospital to deal with this disease, that in a tenement house where we had a large family, probably eight or ten people occupying two or three rooms, that the first case that came down with diphtheria was not very sick. The second case was always a

LIBRARY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA

little more virulent; and there seemed to be a ratio there, the more of the children that were sick, the more virulent the disease became. And I think, as Dr. Abbott has said and read in that book to us, that, if you can take the patient to the hospital, the type of the disease is going to be less virulent. That is the point I tried to bring out. As regards the anti-toxine, anti-toxine has received all the credit for the decrease of diphtheria; but I think the isolation of cases has been a great factor.

THE CHAIRMAN.— If the Association will pardon me, I should like to suggest that there is one thing connected with this question of isolation of contagious diseases, particularly with diphtheria, which has given us in Boston, as I fancy it has you, gentlemen, in other cities, a great deal of trouble; and that is the official care of persons who are carrying diphtheria bacilli in their throats without being ill. It is a very serious question with the boards of health as to what shall be insisted upon; and I have thought that it would be worth while for this Association to give a prize — and we can well afford it — for the best essay obtainable on this subject. I do not know if the Association is ready for this question, but I would like to see if the Association will have a committee appointed who shall be authorized to award a prize of fifty dollars for the best paper on this subject. Personally, I can see no better way of calling out the best thought on this subject than in such a course as this. Our funds are ample, and I do not know of any better way of using a moderate amount of money than this. Is there any one who would like to say anything upon this question?

DR. A. E. MILLER.— Mr. President, it seems to me that it would be a very fine idea to carry your suggestion into effect; and I would move that a committee of three be appointed to take this matter into consideration, appointed by the chair,— a committee of three.

DR. PRESCOTT.— I second the motion.

THE CHAIRMAN.— Do you mean a consideration as to whether or not we should adopt this course?

DR. MILLER.— No, sir, I would amend my motion. I would move that we adopt this course, and that a committee of three be appointed to receive the essays and make the different regulations found to be necessary. In the first place, that we adopt this plan, and then that a committee of three be appointed to carry it into effect.

THE CHAIRMAN.— Would you divide your motion into two parts?

MR. MILLER.— Certainly. I would move that the suggestion of the President be adopted.

DR. PRESCOTT.— I second the motion.

THE CHAIRMAN.— It is moved and seconded that a prize of fifty dollars be offered for the best paper upon the subject of what we shall do with persons in whom we find diphtheria bacilli without illness, either during convalescence from diphtheria or otherwise.

A MEMBER.— I should like to ask if that is limited to the members of this Association.

THE CHAIRMAN.— No, sir, it is not so intended.

Motion duly carried.

THE CHAIRMAN.— I should like to suggest a committee of five instead of three. Do you agree to that, Dr. Miller?

DR. MILLER.— All right.

THE CHAIRMAN.— How shall this committee be appointed?

DR. MILLER.— Appointed by the chair or presiding officer.

THE CHAIRMAN.— It is moved and seconded that a committee of five be appointed by the chair to receive the essays and select the best one upon this subject. Anything to be said?

A MEMBER.— I would move that the Chairman be a member of that committee *ex officio*.

DR. ABBOTT.— I should like to suggest one or two things in addition to that; that is, that the committee be authorized to limit the length of the paper, and that they be authorized to divide the prize in such a way that it would be expended in three parts,— one of twenty-five dollars, one of fifteen dollars, and one of ten dollars. It seems to me that it would give a wider and more encouraging feature to those who compete for it.

DR. CHAPIN.— Mr. President, I should like it very much if the scope of that subject could be made a little broader. I have looked at it a great deal; and I have not been able to find very much evidence as to the prevalence of the diphtheria bacilli in throats of well persons, and still less as to its danger. Now it is very important, in giving our sanction to any line of treatment of such a case, to have

sufficient data upon which that treatment should be based. I should be glad if the scope of the subject could be broad enough to embrace that, its danger as well as the treatment of the person.

THE CHAIRMAN.— I think it would be necessary to rescind this other vote, Dr. Chapin, before we could amend it, now that it has passed.

MR. ELLIS.— Mr. President, couldn't that all be left to the committee to arrange details?

MR. CHAPIN.— With full power.

THE CHAIRMAN.— I think that may be arranged, doctor, without a vote. It has been moved and seconded that a committee of five be appointed by the chair to receive the essays and select the best one. Those in favor will say aye.

Carried.

DR. PRESCOTT.— I will second the motion to add the Chairman.

DR. ABBOTT.— I will put that motion, if you are too modest in the matter. Those in favor of having the Chairman added to this committee say aye.

Carried.

The committee consists of Dr. S. H. Durgin, *ex officio*, Dr. William H. Prescott, Dr. Hibbert W. Hill, Dr. C. V. Chapin, and Dr. J. Arthur Gage.

Before adjournment a unanimous vote of thanks was tendered to Mr. Ellis for his entertainment, after which all present were carried by special cars to Wauwinet Farm, West Newton, Mr. Ellis's dairy farm, which has been referred to in previous numbers of this *Journal*, and a detailed description of which follows.

JOURNAL OF THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH

April Meeting, 1898

SUBJECTS: Proper Isolation of Infectious Diseases — A Model Dairy Farm

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A MODEL DAIRY FARM.

Wauwinet Farm, situated on Commonwealth Avenue, almost in the geographical centre of the city of Newton, is the result of a systematic attempt to furnish, direct to consumers, absolutely pure milk of the highest quality, produced, bottled, and delivered under the most favorable conditions. From an exceedingly small beginning, with a herd of four cows, furnishing in 1891 milk for the proprietor's family and allowing of the sale of about sixteen quarts per day to neighboring customers, it has grown to a total daily output, in 1898, of about sixteen hundred quarts of milk, all sold and delivered within a radius of about three miles from the main farm. Where in 1891 the stock was all kept in a small shed, to-day three farms, with extensive barns, are required for the accommodation of the herd of cattle; and new buildings, equipped with the most modern devices and machinery, are used in the conduct of the business.

At the home farm one hundred and forty-three of the best milking cows are constantly kept, while at Wauwinet Farm No. 2, situated at Kendal Green, Weston, five miles away on the road to Concord, Mass., are kept the cows giving the least milk. Wauwinet Farm No. 3 is situated in Concord, and here are kept the dry stock and young stock. Wauwinet No. 2 has a capacity of seventy cows, while at Wauwinet No. 3 one hundred head can be accommodated. Between these three places are now kept about two hundred and fifty cows, all Jersey, or Jersey grade, producing milk which averages by chemical analysis nearly fifteen per cent. total solids and five per cent. of butter fats. A few cows giving less rich milk are kept for the special purpose of furnishing infants' food. The stock is transferred from one farm to another in specially built wagons, carrying six cows at a time. A load is made up at the home farm of the cows giving the least milk, and these are taken to Kendal Green, where they are exchanged for the same number of nearly dry cows, which are transferred to Concord. Here a load of fresh cows is taken on and returned to Wauwinet Farm No. 1, the entire trip consuming a day.

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PARTIAL FRONT VIEW OF BARNS.

REAR VIEW OF BARNS AND SILO.

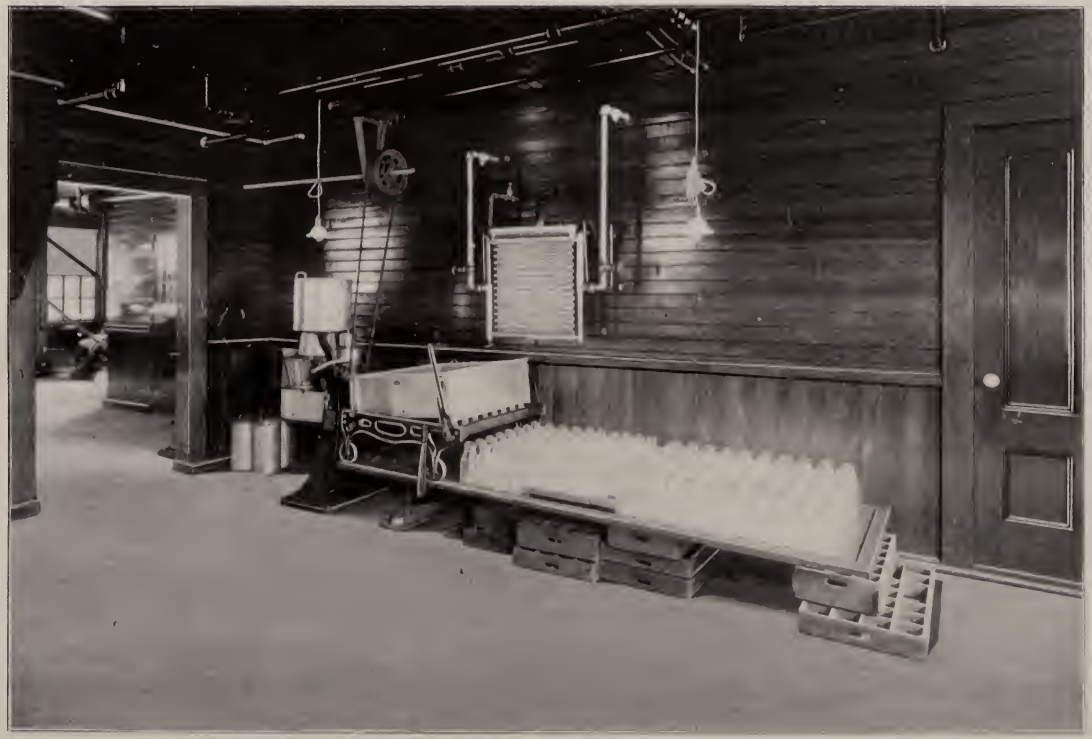
The main farm, where most of the milk is produced, and which is headquarters for its distribution, consists of twenty-five acres, and contains three adjoining barns, the largest of which, one story with monitor roof, built in 1896, is one hundred and twenty-seven feet long by eighty-five feet wide, and contains ninety-two pens, each seven feet by nine feet, similar to box-stalls, in which the cows are never tied. Each pen is supplied with a hinged feeding-manger, which, when not in use, is shut down, thus excluding all dirt, and with a drinking-trough with a galvanized iron cover, easily raised by the cow's nose, furnishing a constant water supply.

There are no floors to these pens, but over the surface of the ground — which is part loam and part gravel — are spread about four inches of sand; and over this is a good layer of planing-mill shavings. In cleaning the barns, the droppings and dirt are gathered in a cart specially built for the purpose, which is driven through the alleys every day; and fresh shavings are supplied, while as often as need be (usually once in from four to six weeks) a more thorough cleaning is undertaken, and fresh sand supplied. In the older barns the cattle are confined by the Prescott stanchion; and here the cows stand upon eight inches of sand, laid upon a concrete floor, with a gutter behind the stalls which is thoroughly cleaned every day. The barn cleanings are dumped from the cart into a large wagon, and are immediately carried to some of the outlying land.

The employees are all dressed in white duck suits at milking time, and are required to keep themselves and their cattle scrupulously clean, the cows being thoroughly groomed every day. Each man milks fifteen cows, milking commencing at four o'clock A.M. and three o'clock P.M., and occupying nearly two hours at each time.

Adjoining the barns is a two-story house, about twenty-five feet by fifty feet, containing a bottling-room, engine-room, and cold-storage room on the ground floor, and chambers for the help on the upper story. Behind the barn is a silo, twenty-four feet in diameter and forty feet deep, capable of holding about five hundred tons of ensilage; and there are several outbuildings for calves, bulls, etc. Sixteen horses are quartered in the large barn, and five bulls — all registered Jerseys — are kept for the service of the herd. Beyond the bottling-room is a good-sized boarding-house for the help, and in

INTERIOR OF NEW BARN.



SEPARATOR. BOTTLE FILLER. STAR COOLER.

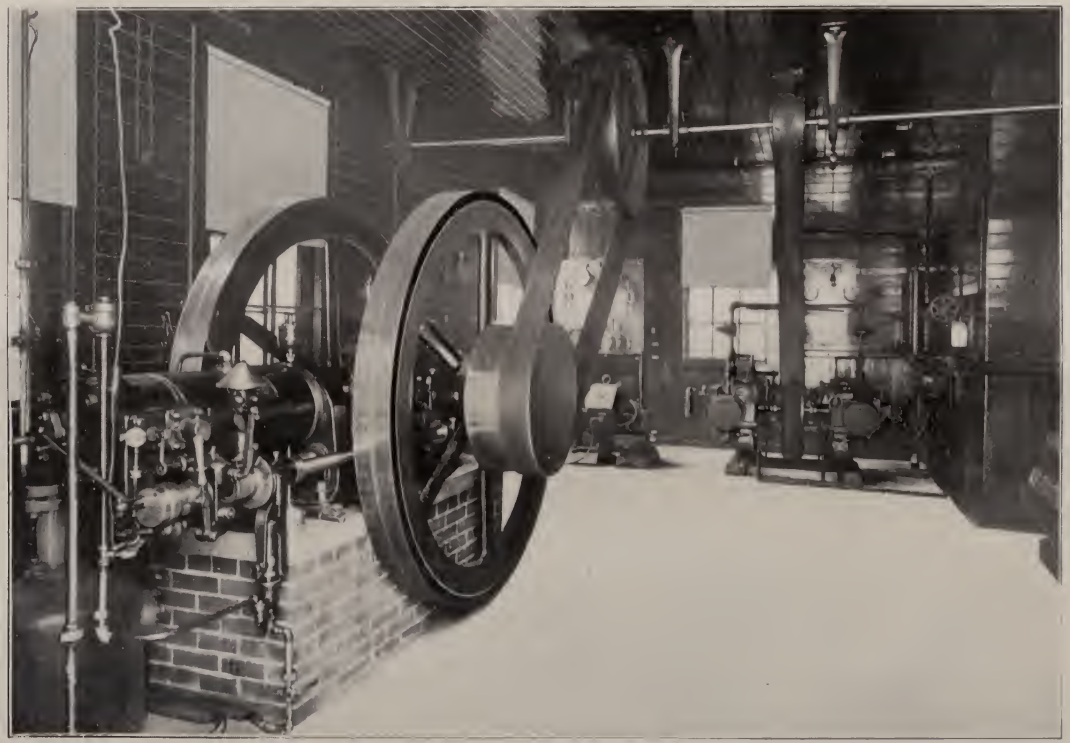
BOTTLING-ROOM.

this building the farm office is located. On the three farms from twenty-eight to thirty-five men are regularly employed, according to the season; and extra help is employed during ensilage cutting. Most of these men are permanently quartered on the home farm.

During milking, each pailful of milk is emptied into a tank at the end of the barn, next to the bottling-room. On entering and leaving this tank, the milk is strained through cheese-cloth, and is carried through the partition into the bottling-room to the distributing trough of a Star milk aërator and cooler. This apparatus, which aërates the milk and gradually but quickly reduces its temperature, consists of a double corrugated surface of sheet copper, heavily tinned, through the inside of which is forced a continuous stream of cold water or brine while the milk passes from the distributing trough in such a way as to flow over the entire surface in a thin film, leaving the cooler at a temperature suitable for immediate delivery. By the construction of the Star cooler the water or brine is forced upward through the inside of the cooler while the milk is flowing downward over the outside, thus insuring the most gradual and continuous reduction of temperature. The extent of surface is sufficient to insure the milk leaving the cooler at a temperature only a few degrees higher than the temperature of the water or brine within.

This apparatus at Wauwinet Farm is cooled by brine from a refrigerating plant manufactured by Westinghouse, Church, Kerr & Co., of a capacity equalling the melting of two tons of ice each twenty-four hours, which effects a reduction in the temperature of the milk from about 95 degrees to about 36 degrees during the few seconds required for its passage over the surface of the cooler. This is, of course, a much lower temperature than could be reached by the use of water in the cooler; and it is, in fact, possible to flood the cooler with brine cold enough to freeze the milk in its passage.

This refrigerating apparatus, the use of which for this particular purpose is quite novel in dairy farms, consists of an ammonia compressor, a condenser, expansion valve, expansion coil, brine tank, and brine pump, and operates as follows: A flask of liquid anhydrous ammonia under pressure, being supplied from the condenser, passes through the expansion valve, a small needle-like opening



OTTO GASOLINE ENGINE. EDDY MOTOR. REFRIGERATING CONDENSER.

ENGINE AND REFRIGERATING ROOM.

COLD STORAGE ROOM. BRINE PUMP. WINCHESTER HEATER.

ENGINE-ROOM, LOOKING TOWARD BOTTLING-ROOM.

which admits the ammonia slowly into the expansion coils of pipe within the large brine tank. The sudden expansion (evaporation) of the liquid ammonia into ammonia gas rapidly reduces the temperature of the brine in the tank, after which the gas is drawn back into the compressor, from which it passes through the condenser, a series of pipes cooled by a continuous film of water flowing over their surface, in which the ammonia gas is condensed into liquid ammonia, to be forced again through the expansion coil, this operation being repeated almost indefinitely without recharging.

Meanwhile the brine, cooled to a low temperature, is forced by the brine pump through the milk cooler, and back again into the tank for recooling, another practically indefinite operation. This process is similar to that by which artificial ice is made; and, in addition to the use made of the brine in connection with the milk cooler, the compartment which contains the brine tank, being kept at a temperature of about 40 degrees, forms a perfect refrigerator, used for the storage of milk. The expense of such a process is almost entirely in the first cost of the plant, as it does not require recharging with ammonia or a resupply of brine oftener than once a year.

The refrigerating plant is operated by an Otto gasoline engine (size 5 B), of 13½ actual horse power, which also furnishes all the motive power required at the farm. In addition to running the refrigerating compressor and brine pump, it operates the dynamo, separator and two water pumps. The great value of such an engine is found in its compactness, occupying but a small space; its simplicity, requiring no engineer, and easily run by any intelligent operative; and its extreme economy. All the barns and buildings at the home farm, including the proprietor's house, are lighted by electricity, which is furnished by a ten horse power Eddy dynamo run by the gasoline engine. In addition to running the electric lighting plant, the dynamo also furnishes power through a seven and a half horse power Eddy motor, which is mounted on a portable car, and operates the machinery used in cutting corn for feed and for the silo. This motor has replaced a horse treadmill formerly used in cutting the fodder and an engine formerly required for cutting ensilage. The dynamo has proven satisfactory and economical in the highest degree, being entirely automatic, and requiring no skilled

WAUWINET No. 2, KENDAL GREEN, MASS.

WAUWINET No. 3, CONCORD, MASS.

labor for its operation. The gasoline engine at Wauwinet Farm has been in operation for about a year, during which time it has cost almost nothing for repairs, and has easily furnished all the power required for the electric lighting, refrigerating, and other machinery of the farm at an average cost of about sixty cents per day.

The heating of the bottling-room, engine-room, seven chambers for help, and a smoking-room for the men, as well as the supplying of hot water for the washing of bottles and all other purposes required, is effected by a Winchester heater which has proven durable, easily operated, and economical in its service.

Returning to the bottling-room, the milk, on leaving the cooler, is bottled quickly and automatically by means of a Child's patent milk-bottle filler. The milk flows from the cooler into a large tinned copper tank, in entering which the milk is again strained through cheese-cloth. This tank runs on wheels on a track over a slab on which the milk-bottles are placed in rows of eight. In the bottom and at one end of the tank is a row of valves fitted with rubber caps, which, by means of a lever, are pressed down tightly over the mouth of each bottle in the row, while by the same movement of the lever the valves are opened, allowing the milk to flow into the bottles. Since the automatic valve seals each bottle tightly while in position, as soon as one bottle is filled, it does not overflow; and, when all the bottles in a row are filled, the milk will cease to flow. The lever is then raised, closing the valves and raising the tank, which is wheeled into position over the next row of bottles, and the process repeated. An air-vent destroys all foam, allowing the bottles to fill, leaving just room enough for the paper cap — used to close the bottles — to go on without spurting. The Common Sense milk-bottles are used, having no cover, easily and quickly cleaned, and sealed with a heavy wood-fibre paper cap, prepared to resist moisture from within and without, and which, when pressed into the neck of the jar with the thumb, is held in position by a shoulder blown in the bottle. This forms an air-tight cover, which will not leak, no matter in what position the bottle is placed. The caps can be instantly lifted out by a pen-knife or any sharp instrument, and are so inexpensive that they can be discarded after once being used.

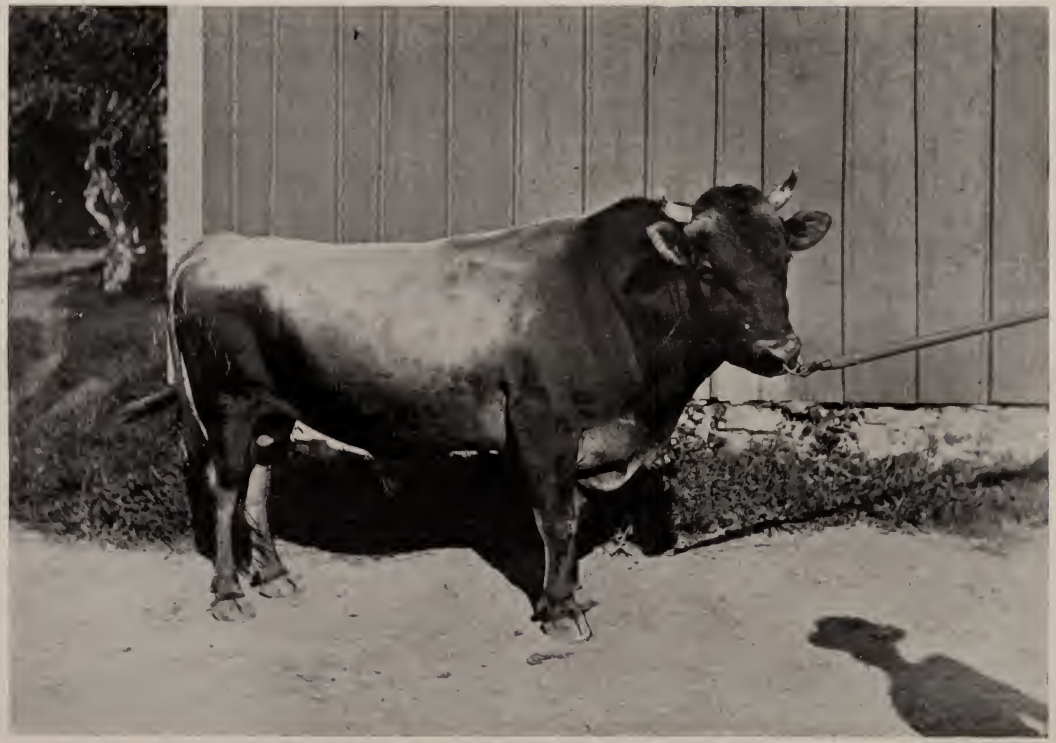
The delivery of milk is made night and morning, four low-down

wagons being used, each starting out as soon as it can be loaded, so that much of the milk reaches the customer within an hour from the time it leaves the cow.

Situated as the farm is, in the midst of high-priced land, the feed problem is a serious one. At the home farm the cows are fed in the barns all the time, although they are turned out in a five-acre lot for exercise every week-day in pleasant weather. In winter the daily feed is from thirty to thirty-five pounds of good ensilage, eight to ten pounds of mixed grain, and all the good hay, principally clover, that the cows will eat. As soon as good soiling crops can be had in the spring, they are largely substituted for the ensilage, although, preferably, a small amount of the latter would be fed every day. The soiling crops are first winter rye, then winter wheat, followed by clover, and peas and oats, which are sown at various times (beginning as soon as the frost leaves the ground), until good, fairly matured sweet corn can be obtained. This is then the main reliance until frost comes, when ensilage is resumed. The total acreage owned and leased is about eight hundred acres.

In view of the feeling sometimes expressed, that the conducting of dairy farms upon such lines as these must be the result of a hobby and cannot be profitable as a mere business venture, it is only fair to say that, while Wauwinet Farm has undoubtedly been developed by the deep personal interest of its proprietor in the problems of a perfect dairy system, its results are such as to amply justify the prosecution of an experiment so congenial to its owner's taste. The enormous increase in the business has come about without the aid of advertising or special effort to secure trade. The milk is sold at eight cents per quart, from one to two cents higher than the price obtained by other producers in the same field; and the demand for the milk is in excess of the present capacity for production.

YOUNG STOCK AT PASTURE.



SIR MICHAEL STOKE POGIS, A.J.C.C., 25624.

JOURNAL OF THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH

July Meeting, 1898

SUBJECTS: Disposal of Sewage of Small Villages, Public Institutions, Factories, etc. — The Quarantine Department of Boston — On the Regulation requiring Two Consecutive Negative Cultures for the Release of Diphtheria Cases

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THE JOURNAL OF THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH was organized in Boston in March, 1890, with the following objects: the advancement of sanitary science in the Commonwealth of Massachusetts; the promotion of better organization and co-operation in the local Boards of Health; the uniform enforcement of sanitary laws and regulations; and the establishment of pleasant social relations among the members of the Association.

All persons holding appointments as members of a Board of Health in a Massachusetts city or town, the executive officers of such a local board, and the members of the State Board of Health are eligible to membership. Other persons may be elected members by vote of the Association. The annual dues are one dollar and fifty cents, and should be paid to the Treasurer, James B. Field, M.D., 329 Westford Street, Lowell, Mass.

The Association holds four regular meetings each year, the annual or January meeting always being held in Boston.

THE OFFICIAL JOURNAL OF THE ASSOCIATION is a quarterly publication, containing the papers read at the meetings, together with verbatim reports of the discussions following them. No part of this matter is printed in any other periodical.

The JOURNAL will present, from quarter to quarter, a fair and adequate picture of the progress of practical sanitary science as applied to the needs of a modern community. The various subjects which are reviewed in the quarterly meetings of the Association are treated by experts qualified to speak from daily experience in Public Health offices, who, as men of science, are careful to be scientific and comprehensive, and who, as public officers, are no less careful to speak pertinently and so as to be easily intelligible to the layman.

The JOURNAL, in a word, appeals to all whose interests touch the questions of sanitation and hygiene,— to the architect, the school-committee-man, the manufacturer, the contractor, and, above all, to the busy practitioner who has no time for any reading but what is brief and to the point.

The subscription price of the JOURNAL is one dollar a year, payable in advance. Single numbers, twenty-five cents. It is on sale at the Old Corner Bookstore, and at Smith & McCance's Bookstore, 57 Bromfield Street, Boston.

All communications to the Association should be addressed to the Secretary, **EDWIN FARNHAM, M.D., City Hall, Cambridge, Mass.**

Subscriptions and all business communications should be sent directly to the publishers,

SMALL, MAYNARD & COMPANY,
6 Beacon Street, Boston.

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ORGANIZED 1890.

[The Association as a body is not responsible for statements or opinions of any of its members.]

VOL. VIII. October, 1898. No. 3

JULY MEETING

OF THE

Massachusetts Association of Boards of Health.

The quarterly meeting of the Association was held at Gallop's Island, Boston Harbor, on the afternoon of July 28, 1898. In the absence of the President the meeting was called to order by Dr. S. H. Durgin, Vice-President, who said: —

The following names have been handed in and recommended by the Executive Committee for membership in the Association.

WALTER C. KITE, M.D.	Milton.
FRANK T. HARVEY, M.D.	Clinton.
F. W. KENNEDY, M.D.	Lawrence.
A. E. MERRILL, M.D.	Somerville.
T. J. ROBINSON, M.D.	Taunton.
C. W. HARLOW, M.D.	Melrose Highlands.
D. R. BROWN, M.D.	Salem.
ARTHUR HUDSON, ESQ.	Newton.

The above-named gentlemen were elected to membership.

THE CHAIRMAN. — For good reasons we will omit the reading of the records of the last meeting. The next on the programme is

Incidental Business. Has any one any business to bring before the Association at this time? If not, we will listen to a paper by X. H. Goodnough, Chief Engineer of the State Board of Health, on the "Disposal of Sewage of Small Villages, Public Institutions, Factories, etc."

DISPOSAL OF SEWAGE OF SMALL VILLAGES, PUBLIC INSTITUTIONS, FACTORIES, ETC.

BY X. H. GOODNOUGH, CHIEF ENGINEER STATE BOARD OF HEALTH.

With the rapid growth of urban population which began in Massachusetts some fifty years ago came the necessity of general systems of public water supply. For many years these supplies were confined to the cities and large towns; but the great advantages to a community of a satisfactory modern public water supply were quickly appreciated by the smaller communities, so that, while in 1870 there were but 20 cities and towns in the State having modern public water supplies, the number at the end of the year 1897 was 160. At the present time 120 out of the 130 towns in the State having a population by the census of 1895 in excess of three thousand persons are provided with public water supplies, and no less than 40 towns having a population of less than three thousand are provided with such supplies.

The accessibility of an abundance of water under high pressure has caused a great increase in the number and variety of water fixtures, and there has been a general and rapid increase in the quantity of water used per inhabitant in the cities and towns in which public water supplies have been introduced. With the far greater amount of water used, old methods of disposal of the household sewage and wastes became inadequate in thickly populated districts; and the introduction of general systems of sewerage, especially in the larger towns, soon followed the introduction of public water supplies.

The general method of disposing of the sewage in the beginning was to discharge it into the most convenient body of water, in many

cases into streams which were used farther down as sources of public supply, the users of the water being comforted with the assertion that running streams purified themselves. There being some doubt, apparently, as to how great a distance a stream must run before becoming purified, the legislature decided in 1878 that no sewage or other polluting matter should be discharged into any stream used as a source of water supply or upon whose banks a filter gallery so used was situated within twenty miles above the point from which the supply was taken.

While this law afforded much protection against the pollution of public water supplies, there was nothing to prevent the pollution of streams or other bodies of water not affected by the act; and it was found in some cases that the discharge of sewage into a stream or tidal estuary resulted in creating a very serious nuisance, so that it became evident that some more satisfactory method of disposing of the sewage was necessary and that something more definite must be done for the protection of the purity of public water supplies and inland waters and for the disposal of sewage.

In 1886 the legislature directed that the State Board of Health should have general oversight and care of all inland waters, and all cities and towns, corporations, firms, or individuals either having or intending to introduce systems of water supply, drainage, or sewerage, were required to give notice to the board of their intentions, and to submit for its advice outlines of their proposed plans or schemes relating to water supply or sewerage. The board was also authorized to make experiments to determine the best practicable methods for the purification of water, drainage and sewage, and the disposal of the same, and was authorized to employ such expert assistance as might be necessary.

Experiments upon the purification and disposal of sewage and the purification of water were begun at Lawrence under the direction of Mr. Hiram F. Mills, a member of the board, in the early part of the year 1888; and it is my intention to give a brief summary of these experiments so far as they relate to the purification of sewage by intermittent filtration through sand or gravel.

Previous to these investigations very little was definitely known anywhere as to the purification and disposal of sewage. In some

places in the Old World the sewage of cities and towns was disposed of upon land; but very little was definitely known as to the conditions most favorable for the purification of sewage by any given material, and there was much doubt as to whether it could be purified at all. The portions of the experiments relating to the filtration of sewage were conducted chiefly for the purpose of determining the fundamental principles of filtration not previously established and to learn what could be accomplished by filters made of some of the widely varying materials found in suitable localities for filtration areas, and to learn from these results the probable efficiency of other materials to be found throughout the State.

Several circular tanks, 17 feet 4 inches in diameter and 5 feet in depth, having an area of $\frac{1}{200}$ of an acre, or a little over 200 square feet, were filled with soils of various kinds selected from lands which might be used for sewage disposal purposes. It was soon found that some of the soils, such as those found in our meadow lands and the mingled gravel and clay of some of our hillsides, which is known as hardpan, were of such an impervious nature that little or no sewage could be made to pass through them. Black loam and the brown garden soils are also, when they are fine, useless as filters for purifying sewage; but the gravels and sands, from the coarsest almost to the very finest, are found to be capable of purifying effectually sewage applied to them in various amounts, depending upon the size of the particles of the material.

From these investigations it was soon found that the purification of sewage by filtration through sand depended upon applying the sewage intermittently, so that air was allowed to enter the filter between the times when sewage was discharged upon it. The organic matter in the sewage was thus converted to mineral matter, and passed off in the effluent.

Four of these filters have now been in operation for ten years, and two others for periods of seven years; and sewage has been applied to them, practically, continuously up to the present time. The soil placed in the different filters was of various composition, varying from small gravel stones to the very fine river silt found in the valleys of some of our rivers, which looks in its natural state like dust. To the filter containing the finest material there is now being

actually applied an average of 600 gallons a week, equivalent to a little less than 20,000 gallons per acre per day; while the coarser and more favorable materials for sewage purification will pass about three times this quantity of sewage, or about 300 gallons per day, equivalent to 60,000 gallons per acre per day.

The main body of sand in these filters has never been disturbed since the filters were started; but the solid matters tend to collect in the upper layers of the filter, and it is necessary to disturb the surface about once a week by raking. Once or twice a year spading is necessary to a depth of from six to eight inches. Occasionally some of the clogged sand from the surface is removed and replaced with clean sand, but this has not been necessary for five years.

The effluent from these filters has been carefully examined; and, with the very strong sewage of the city of Lawrence which is applied to the tanks, more than 90 per cent. of the organic matter has been removed during the past year, and more than 99 per cent. of the bacteria.

As a result of the experience gained in these and similar experiments, the board has been able to give definite advice to cities and towns with reference to the purification of sewage; and many of the cities and towns of the State now purify their sewage by filtration upon land, and produce a clear and colorless effluent, which has no unfavorable effect afterward upon the appearance or odor of the water into which it may be discharged.

The principles which have been found successful in disposing of the large quantities of sewage produced in the larger cities and towns have also been successful when applied to very small communities and to hospitals and other public and semi-public institutions. Several such institutions, in which the population ranges from 200 to 1,200, now purify their sewage by intermittent filtration. In fact, this method of sewage disposal has been successfully used for buildings containing as small a number as twenty persons.

It also sometimes happens that, in providing a general sewerage system for a town, a few thickly settled streets, lying perhaps in another watershed, must be omitted from the general scheme; and it has sometimes been the case that such districts are compelled to go without sewerage facilities until the population has increased suffi-

ciently to warrant the expenditure necessary in connecting the districts with the general sewerage system of the town. In such cases it is often feasible to provide sewerage facilities for the district by preparing a small filtration area for the disposal of the sewage until the growth of the district may warrant its connection with the main system.

In some cases the necessity of pumping sewage to a higher level in order to purify it has prevented the undertaking of a necessary sanitary improvement, but the recent introduction of oil and gas engines of great economy in operation may prevent the necessity of pumping from being in the future a matter of such serious consideration as it has been in the past.

To successfully purify sewage by filtration through sand, it is necessary, as already stated, that the sewage should be applied intermittently. Moreover, it is very desirable, in designing the works, to so construct them that they can be operated with the least possible care. For these reasons it is desirable that sewage be discharged upon a bed in considerable quantity at intervals rather than it be allowed to flow continuously for a considerable time. Especially is this true in the winter season, when, if a small quantity of sewage is allowed to flow steadily upon a filter bed, there is much more danger of trouble from freezing than if the sewage is discharged in considerable quantity. Little difficulty is experienced in disposing of sewage by filtration in the winter season, even in the coldest parts of the State, if the filter beds are properly prepared and operated. To secure intermittency in the operation of the filters, it is the custom in gravity systems to provide a collecting or flush tank so arranged that it will discharge its contents automatically at intervals through the twenty-four hours.

In most of the larger systems of sewage disposal the sewage arrives at the filtration area after flowing considerable distances through the sewers and often after being stored in a reservoir and pumped through a long force main, so that the solid matters are in a finely divided state and the sewage is considerably decomposed; but the sewage from the hospitals and public institutions is usually fresh, and, in applying the fresh sewage to a filter, a greater proportion of the organic matters will accumulate upon the surface or in

the upper layers of the filter than in the case of stale sewage, in which the organic matters have decomposed to a greater extent and much of the nitrogen is in such a form that it enters the filter in a state of active decomposition, and passes off as harmless mineral salts in the effluent.

It is practicable to remove much of the organic matter from sewage by sedimentation, chemical precipitation, and various mechanical means; and a greater quantity in proportion can be removed from fresh than from decomposed sewage. If a satisfactory method of disposing of sludge is available, the area of filters can be reduced by removing the solid matters from the sewage before discharging it upon a filter.

These and other matters of detail must be considered in connection with the circumstances of the location of the buildings from which sewage is to be taken and with reference to the location of the proposed filter beds or disposal works.

For the present each new problem is apt to present new engineering features, and it is difficult to make rules as to details of construction of works for sewage purification on a small scale that would be generally applicable. Moreover, while the general principles of sewage purification are now well known, the investigations of the board and the results of the practical operation of filters now in use in various places are constantly furnishing new information as to results obtainable by filters of different construction, and as to different methods of operation and of treatment of sewage before filtration.

One of the chief causes of pollution of many of our streams has been the sewage from factories. Tanneries, paper-mills, and wool-scouring establishments are prominent among the manufacturing establishments which produce large quantities of manufacturing sewage; and a factory in either of the industries mentioned may produce as much sewage as a large town, and the organic matter in the sewage of some of them may be several times as great as an equal volume of domestic sewage, so that the purification of such sewage is as important in protecting the purity of streams in many cases as the purification of domestic sewage of a town.

The problem of the purification of manufacturing sewage has re-

ceived special attention by the board; and much interesting, valuable information has been obtained from experiments with reference to the purification of sewage of this character.

In the investigations as to purification of sewage from such establishments it has been found in some cases that the sewage can be purified by filtration in a manner similar to the methods of purifying domestic sewage. But careful analyses of manufacturing sewage have shown that in some cases the chemicals used in the manufacturing processes are of such a kind as would destroy nitrification if the sewage should be applied to an ordinary sewage filter directly as it comes from the factory. Ordinary methods of chemical precipitation also have little effect upon some kinds of manufacturing sewage. Where mingled with a sufficient quantity of domestic sewage, however, manufacturing sewage can generally be purified readily by methods that are successful in the purification of domestic sewage; but, where the manufacturing sewage alone is to be treated, these methods may or may not be applicable. For instance, an examination of the sewage of two tanneries showed that the sewage of one of them could be easily purified by filtration through sand after the heavier organic matters, or sludge, had been removed by sedimentation or other means; while in the other, doing practically the same kind of work, a chemical was used which, practically, wholly prevented nitrification, and sewage could not be purified until the effect of this chemical had been neutralized.

Recent examinations of paper-mill sewage show that the polluting matters are of a carbonaceous rather than nitrogenous character, so that the pollution may perhaps be removed better by straining or some form of precipitation than by filtration.

A wool-scouring establishment of considerable size may use as much as a million gallons of water a day in the various processes; but only a comparatively small portion of the total outflow comes from the scouring process, the greater portion being water used in rinsing. The investigations thus far made indicate that it is practicable to purify sewage from such establishments to a sufficient extent to prevent its seriously polluting a stream into which it might be discharged.

Our investigations show in general that, while it is feasible to

purify the sewage from manufacturing establishments of these kinds at least, there is such a wide variation in the quality of the sewage that it is impracticable as yet to prescribe a general method of purifying such sewage. It will therefore be seen that it is very necessary, in seeking to prevent nuisances due to manufacturing sewage, to learn definitely in each case the nature of the problem with which it is proposed to deal before prescribing a remedy therefor.

THE CHAIRMAN. The importance of this paper is readily seen by every board of health. There are frequently found instances where in the absence of sewers the cesspool is used, the overflow from which makes almost as great a nuisance as if the flow had been directly upon the ground without the cesspool. In the outskirts of cities and throughout towns this state of things will be found, and it has often occurred to me whether or not the filtration system which is practised on a large scale may not be utilized on a very small scale; and, instead of the overflow of the cesspool going directly into the brook or river, it may be filtered, and the effluent water from the filter go into the brook or river without any harm. With the purpose of bringing this question before the Association, I have asked for this paper to be prepared by a competent engineer.

The paper is open for discussion, and I have no doubt Mr. Goodnough will be willing to answer such questions concerning this process as members may be disposed to ask. I will call on Professor Kinnicutt, of Worcester.

PROFESSOR KINNICUTT.— *Mr. President and Gentlemen of the Association.*— There is one thing in Mr. Goodnough's paper to which I think he did not draw sufficient attention, and that is the work that has been done by our own State Board of Health. I have been more or less connected with sewage work since 1881. In 1883 Worcester was obliged to purify its sewerage before emptying it into the Blackstone River. Before that time there was very little accurate information that we could gather in regard to the best method of treating sewage; and Worcester at that time decided, after careful inquiry and research both in this country and in England, to provide itself with a system of chemical precipitation. Now, if Worcester

to-day had the same problem before it, it would immediately turn to the work which has been done by our own State Board of Health, and the method of the purification of sewage would be very different from that instituted in 1883; and what is true of Worcester can be said of every city and every town in our own State. To-day, owing to the work by our own State Board of Health, we are in a position to know with a fair degree of accuracy what is best to do in various cases.

Now, regarding the purification of sewage of smaller towns, I perfectly agree with your President that I see no reason why the sewage of even our smaller towns cannot be purified comparatively cheaply by intermittent filtration. Your attention has been called to experiments made by the State Board of Health on various kinds of soil, and he might also have said that not only have experiments been made with various kinds of soil, but also with other material; and I think that he will agree with me when I state that any rough, jagged material which is more or less porous can be used for filter beds. Such substances, for instance, as cinders or coal or coke or even burnt clay, are used with success in filter beds, and small filter beds can be made with these materials at comparatively little expense; and, further, with the domestic sewage of most of our county towns I think that we could filter very much larger quantities of sewage on an acre of prepared filter beds than 60,000 gallons per day. I think with most domestic sewage of our small country towns and villages that we might be able certainly to filter and purify sufficiently 200,000 or, possibly, 500,000 gallons a day per acre; and certainly, if we could do that, the expense for our small towns or for hospitals or public institutions would not be very great.

The only trouble that I find with intermittent filtration, especially of domestic sewage, is in winter. I think this can be overcome by careful attention, and the only criticism that I should make in regard to the work of our State Board of Health is that they do no supervising work. The experiments at Lawrence have shown what can be done; but, unfortunately, many of our towns which have put in intermittent filtration beds, after they have once established them, have not looked after them with sufficient care. It seems to me

that the State Board of Health should not only conduct experiments, but should have certainly one experienced man in the field to go to these various towns, and instruct the men who are in charge as to the best way of managing the filter beds. It seems to me that, if the filter beds on a large scale, such as at Marlboro and at Gardner, were supervised a little more carefully, especially in the winter and in the spring months, the results which would be obtained would be a great inducement for other towns to use the same method of purification. [Applause.]

THE CHAIRMAN.— Has any one else a word to say on this question? If there is nothing more to be said, I will ask Mr. Goodnough to close the discussion.

MR. GOODNOUGH.— There is one matter to which Mr. Kinnicutt called attention; that is, the lack of care of some of the filter beds in the State. There is no doubt there is some lack of care of some filter beds, especially in the winter season, but I do not think that it is very general; and, moreover, care is not so necessary in the winter season. The stream into which the effluent may flow has a very much higher flow in winter than it has in the summer. Perhaps, considering the portions that are purified and partially purified, about as little pollution is discharged into the streams in the winter as in the summer in proportion to the flow of the stream. It is also to be remembered that the board has little or no control of some of these city and town filter beds in the State. We have the approval of the plans of town authorities. There is usually a clause in the act which says that, if any pollution is caused to a stream by a sewage effluent, the attention of the State Board of Health shall be called to it, and the board shall do certain things to remedy it. I know of only one instance in which the board has been requested to take any action on account of badly prepared filter beds. This was in the case of a town which certainly has not taken care of its filter beds. I read in the town report of that town the other day, in relation to the construction of the works, that in one year it was decided to dispense with the services of an engineer. In the report for the next year it was stated that for some unaccountable reason

there were 300,000 gallons of water leaking into the sewers, and an engineer was consulted as to how to keep it out. The leakage caused the quantity of sewage to exceed the capacity of the filter bed, which was not the fault of the board, as we had absolutely no control over the construction of the works.

PROFESSOR KINNICUTT.— I did not mean to criticise the board. I only wish the board had the right to go to the various towns and enforce what rules they thought proper.

THE CHAIRMAN.— The next paper in order is a "Brief Account of Quarantine Experiences," by Dr. Paul Carson, Port Physician of Boston.

QUARANTINE DEPARTMENT, CITY OF BOSTON.

BY DR. PAUL CARSON, PORT PHYSICIAN.

The necessity for examining and quarantining vessels for contagious diseases first became apparent in the earlier years of the present century. The old-time sailing packets plying between this country and foreign ports were often long overdue. The food and water supply (never over-abundant) would run short; and the passenger, having been subjected to the hardships of a long voyage, together with the bad sanitary condition of these vessels, easily succumbed to any contagious disease that might have gained entrance. Typhus seems to have been the principal offender, and vessels have been known to lose half their passengers in a single voyage.

The continued arrival of vessels in this condition was a constant menace to the health, not only of the port of arrival, but of the country at large through which the passengers might travel. Several of our large seaport cities suffered from severe epidemics of typhus and small-pox directly traceable to the shipping. To the local governments of these cities who took means to prevent them we owe our present system of quarantine.

Previous to 1893 there had been no uniformity in the conduct of the various quarantines. Each formulated its own rules, and carried

them out in its own manner. Some were extremely efficient; others, the exact reverse. In that year this country was threatened with cholera, as nearly every continental port was infected. The impending danger being so great, the surgeon-general, M. H. S., called a meeting of all the prominent quarantine officers of the country to confer with regard to the best means of preventing, not only cholera, but the other contagious diseases. As a result of this conference, a set of regulations were made, which were to form a basis for all quarantines. Congress at about the same time authorized the sending of medical men to foreign ports to inspect the passengers and cargoes of vessels bound to this country, and also provided that every vessel bound for this country should have a bill of health from the United States consul, making the captain who failed to comply with this regulation liable to a heavy fine. The bill of health is a very important document to the health officers. It states the name, nationality, and rig of the vessel, the number of passengers, if any, number of crew, source and wholesomeness of food and water supply, number and character of cases of diseases that have occurred during the previous voyage, and, furthermore, the number and character of the quarantinable diseases that have occurred at the port of departure for two weeks previous to the time of sailing.

At this port we board all vessels from foreign ports with the exception of the British Maritime Provinces. From June 1 to November 1 all vessels from ports south of Virginia are inspected, this latter inspection being necessary to guard against the epidemics of yellow fever that occur from time to time along the Southern coast.

The hours for boarding are from sunrise to sunset, and all vessels are boarded with as little delay as possible. Immediately after boarding the vessels, papers are examined,—for all practical purposes, the manifest, crew-list, and bill of health are all that are necessary. The captain is then questioned as to whether any sickness or deaths have occurred during the voyage; and, if so, the ship's log is examined, to make out, if possible, their character. If the answers are satisfactory, an inspection is then made of all the quarters; and, by the time this is completed, the crew and passengers (if any) are mustered and ready for examination. For the crew, this examination consists merely in a careful scrutiny of each individual and a

careful count to see that none are absent. The steerage passengers are then made to pass in single file before the physician with their vaccination ticket in hand. If any do not have these, they are made to stand to one side; and an examination into the cause of the absence is made. If, after the inspection has been made, everything is found to be in good condition, a certificate to that effect is given, so that the vessel may enter at the custom-house.

The quarantinable diseases, according to the United States regulations, are cholera, yellow fever, typhus, small-pox, leprosy, and bubonic plague. In addition to these we remove scarlet fever, chicken-pox, typhoid, and measles.

A vessel arriving with any one of the latter diseases, unless there is an epidemic, is allowed to depart after the removal of the case, providing, of course, that it has been promptly isolated. The disinfection of the hospital is left to the medical officer, if he is known to be reliable.

A vessel arriving with cholera on board or from a port infected with this disease is immediately sent to an anchorage within the quarantine limits, all the passengers and crew are removed and bathed, and their clothing and hand luggage sterilized, after which they are allowed to enter the houses of detention. Here they are carefully inspected each day, and no communication is allowed between the various houses. If any cases appear, they are immediately isolated. At the end of twenty-one days from the last possible chance of infection, if they are well, they are released from quarantine. This period covers the incubation of the disease; and, while it seems somewhat long and more or less of a hardship, yet, when we consider the severe financial loss which would follow the paralysis of commerce due to an epidemic of cholera, we take a different view of the matter.

After removing the crew and passengers, the vessel receives attention. It is first rendered mechanically clean, or as nearly so as possible. Then every part of the vessel which can by any possible means have become infected is washed with an acidulated solution of mercuric-chloride, 1 to 800. On any parts where mercury would have a bad effect a solution of formalin is used. All bedding, carpets, and fabrics of any kind are sterilized with steam at a temper-

ature of 220 degrees Fahrenheit for thirty minutes. The water tanks are emptied, and washed with a 2 per cent. solution of potassium permanganate. After everything has been thoroughly dried, all the saloons and quarters are fumigated with formaldehyde for six hours, a pint of the 40 per cent. solution being allowed for every one thousand cubic feet.

For yellow fever the treatment of passengers and vessel is the same as for cholera, except that the detention is but for six days. A vessel having small-pox on board would be allowed to depart after disinfection and fumigation, bathing and sterilization of the baggage. Only those who are sick or who cannot show satisfactory evidence of vaccination are detained.

THE CHAIRMAN.— The paper is open for discussion.

DR. COGSWELL.— Mr. Chairman, I should like to inquire — take an average year — how many people are taken from ships in Boston Harbor?

DR. CARSON.— From twenty to fifty.

THE CHAIRMAN.— It is understood by this that many people are taken off vessels for observation without actually having quarantinable diseases,— taken off under suspicion, and held until the diagnosis can be made. I fancy there are a great many members present from inland towns and cities who are not familiar with the routine work of the quarantine, and the port physician will be very glad to answer questions which you may choose to ask. I have just been asked the question "In the case of an infected ship, are the patients taken off or the others?" They would all be taken off. The thing to do in such an instance is to clear your vessel, and place the well people by themselves, watch them daily for symptoms until the period of incubation is gone, and then get rid of them, taking the patients by themselves to a hospital. As soon as the vessel has been cleared of all the people, we can properly disinfect it and start afresh. Are there any other questions to be asked concerning this paper?

DR. MILLER.— Mr. Chairman, some of us would like to know the best method at the present time of disinfecting ships. What method is pursued for disinfecting?

THE CHAIRMAN.— Washing down decks and all surfaces is done here with a strong solution of chloride of mercury, 1 to 500. Clothing and all fabrics which may be treated with steam, without injury, are placed in the steam plant at the island, and treated in that way. Such things as may not be steamed without injury are treated with a 5 per cent. solution of carbolic acid or a 2 per cent. solution of formalin. A chloride of lime solution, say a quarter of a pound or half a pound to a gallon of water, makes a very good solution for washing down decks and hospital floors and other places which are infected. The formalin gas is used in rooms, but it has no power to penetrate. It is only for surface work.

Are there any other questions? If not, we will proceed to the next paper, "The Need for Two Negative Cultures on Release of Diphtheria Patients," by Dr. H. W. Hill, Director of the Laboratory Boston Health Department.

ON THE REGULATION REQUIRING TWO CONSECUTIVE NEGATIVE CULTURES FOR THE RELEASE OF DIPHTHERIA CASES.

BY DR. HIBBERT WINSLOW HILL,

DIRECTOR OF THE BACTERIOLOGICAL LABORATORY OF THE BOSTON HEALTH DEPARTMENT.

Mr. President.— The Boston Board of Health has incorporated among its rules a regulation affecting the release from isolation of convalescent cases of diphtheria, which reads in part as follows: —

. . . "Two consecutive cultures shall prove negative . . . after the disappearance of the false membrane before the case is pronounced free from danger or further isolation pronounced unnecessary."

The Diphtheria Diagnostic Service of the board having been entrusted to me early in May of this year, I wish to present to you the results obtained since that time, in so far as they illustrate the rational basis and practical value of this regulation. You will perhaps pardon me if I review the situation briefly.

The Diphtheria Diagnostic Service is carried on by the Board of Health with two specific objects in view: on the one hand, to afford to the physicians of the city a method of diagnosis, the most readily available and accurate which is at present known for this disease, without additional expense to themselves or to their patients; on the other hand, to afford to those officers of the Board of Health whose special work is the control of contagious diseases the best and, indeed, the only means for determining the time at which isolation may be safely ended. To the physician the *diagnostic* side of the work is chiefly valuable, since it assists him in cases of doubt, and in all cases relieves him of the responsibility for the decision reached. To the Board of Health the chief value lies not so much in the occasional discovery of a diphtheria case which would otherwise have been overlooked, — the most brilliant of the services it renders, — but rather in the prosaic routine of the release work; that is, the work of determining the disappearance of the bacilli after the case is, clinically, a thing of the past.

The extent to which physicians avail themselves of this service sufficiently demonstrates their appreciation of the diagnostic side of the work and their confidence in it. But the remarks appended to the cards sent in to us with the cultures taken from convalescent patients show that the regulation with regard to release quoted above fails to arouse enthusiasm — to put it mildly — in the minds of either the physician or his patient, at least in those cases where the bacilli persist an unusually long time. It is of course easy to understand that it seems a hardship to continue the isolation of a recovered patient, and one certainly sympathizes with the physician who sees in prospect an apparently unending succession of blue cards * as the only response to his equally unending series of cultures. Apart from the weary waiting involved, the physician chafes also under what he or his patients sometimes regard as an implied reflection on his skill, the delay in official release after he has declared the patient fully recovered appearing as a reversal of his decision. This idea is based on a misconception so obvious and simple that it would be unworthy of mention, were it not so wide-spread.

* The notification to the physician of the *presence* of the bacilli of diphtheria is given by cards printed in blue, the absence of the bacilli by cards printed in black.

The mistake consists in supposing that the Board of Health considers the continued presence of the bacilli of diphtheria as showing the continued presence of the disease of diphtheria. Such a position would not be tenable by any authority, because it is contrary to all the accepted facts and accumulated experience of workers since the diphtheria bacillus was first discovered. The Board of Health bases its demand on a totally different ground. It is prepared to admit that in many cases the convalescent patients from whose throats positive cultures continue to be obtained may be fully recovered from the disease. But it is equally convinced that these same patients, while perfectly well themselves, may — and, if positive cultures are obtained from them, do — constitute foci from which the disease may spread, and that for the great good involved in the protection of the public health the patient must continue to suffer the relatively small evil of isolation until he is not only recovered, but also non-infectious. Up to that time the same isolation is enforced as during the progress of the disease itself. From the standpoint of public sanitation, in short, the case must continue to be regarded as a case of diphtheria, although from the clinical standpoint the patient's own condition of health may be perfectly normal.

I do not think it requisite to defend the position that it is both necessary and valuable to consider the disappearance of the bacilli as determining the limit of infectiveness of this disease. The fact that the great majority of diphtheria cases are infective until the bacilli disappear is too widely established to give room for discussion at this time; but the exact amount of bacteriological evidence necessary to establish the fact of the disappearance of the bacilli is another question. Taking it as established that patients with diphtheria bacilli in their throats are infective, it becomes a matter involving considerable responsibility for the authorities officially in charge of the public health to decide just when the bacilli have in fact disappeared, and the patient is therefore really no longer capable of transmitting the disease. The evidence afforded by a single negative culture has been widely relied on to determine this point, and regulations requiring even a single negative for release constitute a great advance on previous precautions. Tobiesen in 1892

was able to demonstrate that 24 out of 46 patients or over 50 per cent., discharged from hospitals, under then existing conditions, were still infective. Yet it is easy to show that, where one negative culture only is demanded before the patient is released, infective cases may still be set free, and that in a sufficiently large percentage of cases as to constitute a very appreciable degree of menace to the public health.

The reasons why a single negative culture for release is of less value in showing the absence of the bacilli than two such negative cultures are not far to seek. To begin at the beginning, and with a proposition which hardly needs statement, a negative culture taken for diagnosis is of less value as evidence than a positive culture, simply because in the nature of things it is more difficult to demonstrate a negative than a positive. If the bacilli are present in a culture when it is examined in the laboratory, there can be little doubt that they were present in the throat from which the culture was taken, provided, of course, that the technique employed was not outrageously improper; but the absence of the bacilli from a culture is not such a matter-of-course demonstration of their absence from the throat, even supposing the technique employed to be of the best. The sources of error involved are too numerous to justify giving the same weight in reaching a decision to a negative culture as to a positive culture. The bacilli, although present, may have failed to reach the swab; or, reaching the swab, may have failed of effective transfer to the serum; or, reaching the serum, may have failed to grow or have been overgrown by other forms; or, developing properly, may yet have failed of transfer to the slide placed under the microscope; finally, even bacteriologists are not infallible, so that the bacilli, although present on the slide, may have been missed in going over the slide with the microscope. Nevertheless, it is true that, granted a careful technique at every stage, a negative culture, despite these qualifications, is usually good evidence of the absence of the bacilli when the culture is taken for diagnosis; that is, in the early days of an attack, when all the symptoms are well marked. Why, then, should it not be equally valuable, when taken for release? There are good reasons to offer. In the first place the average degree of care exercised in taking a culture for diag-

nosis at the time when the physician is naturally most anxious about the case is greater than the average care in taking cultures for release, especially if both physician and patient fail to appreciate the value of the process, and therefore go through with it perfunctorily, even unwillingly, feeling it an unnecessary and troublesome requirement,— a piece of departmental red tape. I do not wish to imply that all or even the majority of physicians feel thus, but I have evidence to show that some of them do. Apart from this, also, a culture for release presents a more difficult problem to the most careful and conscientious operator than does a culture for diagnosis. The membrane which previously formed a guide to the proper point which the swab should reach has vanished. The bacilli are probably fewer in number than they were when the membrane was present, and have also become scattered. At the particular moment when the culture is taken they may have disappeared temporarily from the surface of that part of the mucous membrane reached by the swab, only those remaining which are ensconced in folds or follicles or other inaccessible recesses, from which they may emerge later. It is not necessarily a reflection on the technique of the operator that a culture from such a case should prove negative, while a subsequent culture proves positive. The most experienced culture-takers may sometimes fail under such circumstances. Theoretically, then, it is obvious that, while a single negative culture for diagnosis may be accepted as reasonably likely to represent the true state of affairs, a single negative culture for release is a comparatively flimsy protection against the possibilities of infection involved in setting at liberty persons retaining virulent bacilli in their throats. This is the real basis of the demand for two negative cultures. It is not claimed that the danger is entirely removed by the use of the second negative, but it certainly is very much reduced. It is true that we can produce good evidence and excellent authority for the statement that it would not be unreasonable to require three, or even more, negatives for release. Indeed, this is the practice in the contagious diseases department of the Boston City Hospital, under the highly respected authority of Dr. McCollum. The practical difficulties in obtaining more than two negative cultures in public work, however, are such that, for the present at least, two negatives are accepted for release by our board.

So much for the reasons which led to the establishment of the regulation. I will now present briefly such actual results in practice as bear on this point based on cases examined during the ten weeks beginning on the 10th of May last.

The number of cases examined during this period which gave positive results, and which went on to final release in my hands or were otherwise disposed of, reached 68. Thirteen of these cases, or nearly 20 per cent., yielded, at some time or other during their course, single negative cultures followed by positive cultures. In other words, 20 per cent. of the total positive cases would have been released while still infective, had release on single negatives been the rule.

The length of time which elapses between the first single negative and the last positive culture in any given case represents the length of time during which that case would have been at large and infective under the old rule,— a total period of eighty-four days for the 13 cases quoted. But it is unreasonable to suppose that the bacilli promptly and invariably disappear immediately on the taking of the last positive culture. It is equally unlikely that they always remain in the different throats just up to the date of the first of the two final negatives. Perhaps it is not unjustifiable to suppose that they are present on an average for one-half of the intervening time. This would make the total length of time during which the bacilli were present in these 13 cases, after the first single negative, one hundred and one days, or nearly eight days for each patient. In other words, the introduction of the second negative has, in the last ten weeks, effected a reduction in exposure of the public to infection equivalent to that involved in the release of 20 per cent. of the total positive cases a trifle over one week too soon.

In justice to this subject, I must, however, call attention to the fact that these figures, convincing as they are, do not put the matter in its most favorable light. The calculations so far given are designed to show the actual results based on positive cases of all kinds,— cases which terminated in death or were removed to hospitals or in other ways failed of termination in release at our hands, as well as cases systematically completed by a full set of cultures. A second calculation is necessary, in order to demonstrate the real

value of the second negative. In the calculations already given rather more than one-third of the 68 cases were incomplete; and I have hitherto assumed for convenience that none of these — about 27 in all — would have shown single negative followed by positive cultures, had they been completed. I have, however, no real basis for this assumption. On the contrary, those 41 cases which were systematically examined until two consecutive negative cultures were obtained show a total of 12 cases giving single negatives followed by positives, or, practically, 30 per cent. In other words, while the number of cases showing what may be termed "premature negatives" forms 20 per cent. of the whole number of positive cases, they form no less than 30 per cent. of the cases officially released by us. Practically, then, nearly one case in every three officially declared non-infective would still retain the bacilli, did we accept a single negative culture for release.

In conclusion, I wish to add that, although these figures are based on about six hundred examinations only, and all the calculations must therefore be regarded as rough approximations, I feel little doubt that a year's further experience of the second negative will yield evidence of no less favorable character. I have not attempted even to touch upon many of the interesting and valuable points which relate to the important subject of release by culture, and especially by two consecutive negatives. My principal object has been to demonstrate simply certain actual facts already established.*

The Chairman.— If there should be a board of health within the State of Massachusetts that has had no trouble in the discharge of convalescents from diphtheria, we should be glad to hear from it. I fancy, however, all boards have had the same kind of trouble we have had in Boston. We were formerly very glad to get the first negative, and particularly in cases which linger so long after the clinical appearances have disappeared; but we have been convinced that this method of release was wrong, and that we oftentimes did discharge patients before they were free from diphtheria bacilli.

* Since this article was written, about six hundred additional examinations have been made, exactly 40 per cent. of those officially released by two consecutive negative cultures yielding single negative cultures followed by positive cultures.

The paper is open to discussion, and I hope that every one will express his views on this question.

MR. NEWCOMB.— Mr. Chairman, is it understood that you require two negative cultures in every case before you release the patient?

THE CHAIRMAN.— Two negative cultures in succession before release.

MR. NEWCOMB. — What period of time between the cultures ordinarily?

THE CHAIRMAN.— I should say a matter of two or three days, as a rule.

MR. NEWCOMB.— Is that rule applied in private practice outside of the hospital?

THE CHAIRMAN.— At the hospital they require three negative cultures in succession before they discharge. The cases which we are now talking about are the cases outside of the hospital in private practice.

DR. UTLEY.— Are these two negative cultures taken by your medical inspector, or does the physician in attendance take the first negative culture?

THE CHAIRMAN.— The attending physician is to take one culture, and the second culture is to be taken by one of our officers.

DR. BROUGH.— I would like to say I heartily agree with the taking of two negative cultures; but, when we consider the cases of diphtheria in the city of Boston in the year 1895, there were reported to the city Board of Health some 4,000 cases, but the examinations of the bacteriologist showed only 1,500 positive cases in the city. That left about 2,500 cases in which there was no positive culture; but those cases were reported as diphtheria, the houses were placarded as diphtheria, and every precaution was taken as if they were. Of course, a certain number of that remaining 2,500 went to the hospital perhaps, reducing the number of cases which were not examined bacteriologically, so that enough were proved to be diphtheria to make about 40 per cent. It seems to me, while the necessity of taking cultures in the last stages of diphtheria is necessary, it would be perhaps a good thing if the physicians, in the early stages of the disease, would send in their cultures for diagnosis, because, when we look over cases that are inspected by the Board of Health, we find a

large number of those cases that are reported as diphtheria, for instance, reported to-day and received to-morrow, and a culture is taken that are proved not to be diphtheria. They are treated as diphtheria while really they are not. Possibly, by taking the culture the patient is detained in the house a longer period of time (from the fact that his throat is clear he thinks he is perfectly well) and the children kept away from school; but the whole thing could be obviated if the physician, in the early stage of the disease, would send the culture to the Board of Health, and it would be found that some of those cases which are thought to be diphtheria are not really diphtheria. The error, I believe, in bacteriological diagnosis is not more than 10 per cent.; while in clinical diagnosis there is certainly a very much larger percentage of error.

Dr. Lincoln Chase.— Mr. President, in Brookline, where I live, I think that the board is not troubled very much in the way Dr. Brough has stated. They are very glad to have the assistance of three bacteriological examinations, and almost every case of tonsillitis receives bacteriological examination. The expense is distributed to all the tax-payers; and no one seems to have any objection to bringing in the culture, which makes it very convenient for the physician to send them in. Last October I had a little experience myself with diphtheria, with a little girl, a very severe case. A physician was called in the week after the beginning. I came down myself in two or three days with diphtheria, and had it severely. The germs lingered in my throat and nose seven weeks all together,— four weeks in my throat and three weeks longer in my nose. Dr. Stein was attending me. We took the precaution to wait until I had three successive negative cultures made before I released myself from the room which I had stayed in during my illness. I think that is a very safe practice; and it is the usual practice, I am informed, at the City Hospital. But I did it because I think a physician should be specially careful to set a good example in those things.

We require the time limit in Brookline in which the first culture is made. We ask the physician to have a bacteriological examination made four weeks after the commencement of the case, unless there is some reason for haste in making the culture; for otherwise the phy-

sician and family are doomed to disappointment in a great many cases, where a large number of cultures is made, and we do not think it has a good effect. The physician gets discouraged, and may slight the examination in his zeal to get through with the case.

I would like to ask Dr. Hill through you, Mr. Chairman, about how long a period usually elapses before he gets the first negative report from the examination? Is it two, three, or four weeks, or what number, as a rule?

Dr. Hill.— There is no fixed rule. It varies with almost every case. I have not made up the records so as to show that. It is a rather difficult point to determine.

Dr. Chase.— It will be interesting when the doctor does read that record as a whole. It seems the germ is rarely absent in less than three weeks. We have a time limit requiring one bacteriological examination. The next can be made in the ordinary time, if he chooses.

The Chairman.— If we were to require a time limit of four weeks in every case, we should hit a great many cases in Boston where the poor fellow has been pronounced a diphtheria patient when he has no diphtheria; and, if in addition to that imposition, we should keep him four weeks before we take a culture to see whether he is free from diphtheria or not, I am afraid we should impose a severe hardship. Undoubtedly, it would be a more correct plan to send a competent officer to verify the diagnosis, and to make it sure by a bacteriological test in every instance.

Dr. Chase.— Mr. Chairman, allow me to correct a misstatement I think I made. It is not that we require four weeks before the first culture is made. The final disinfection by the board is not made until four weeks from the commencement have elapsed.

The Chairman.— We can but wish that the more correct method might be put in practice and adhered to, just as we do in cases of small-pox. In that disease, as soon as a case is reported, we send an expert to verify the diagnosis. I think it ought to be so in other infectious diseases, but it would impose a very large amount of work and expense upon the department.

Dr. Abbott.— I am very glad to hear this paper, which is valuable to every local board of health, especially because it treats

of the one subject that is the most important to-day to boards of health; that is, the management and control of infectious diseases. The State Board of Health has no right to issue regulations upon this subject. The laws give it no such power. The power to make regulations lies entirely with the local boards. I do not know anything that has been more troublesome to local boards of health in the last few years than this question of cultures of diphtheria. I have had a great deal of correspondence with local boards of health on the subject, and it is one of the most perplexing things. Another thing is the period of time that elapses before bacilli disappear from the throat. The longest time that we have observed was twenty-one weeks,— a pretty long time, almost half a year.

I will state for the information of members here something in regard to the work which the board is now doing in this matter. Some two or three years ago the board decided to establish a bacteriological laboratory and make diphtheria cultures for those boards that have no facilities of the sort for themselves; and, during the past year, the work has increased considerably over the year before, although it is not yet very large. The whole number of cultures made in 1897 amounted to about 2,200, and it has demonstrated that the work can be done over a considerably large territory. Some five or six hundred of these have come from distances of over fifty miles; and several hundred cultures came from a distance of over one hundred and fifty miles, as the remoter parts of Berkshire County.

The laws in regard to infectious diseases in this State have become more certain and definite. It is charged against us very often by scientific persons that medicine is an inexact science, that we do not know anything with absolute certainty. But it is becoming more exact every day, and this question of diphtheria cultures is one process by which we are bringing such things down to a more mathematical standpoint. For more than seventy years in this State physicians have been required to report infectious diseases, and yet no actual notice has been taken of the law, at least very little practical use has been made of it, until within the last ten years, when, perhaps, some board of health applied a penalty; and the moment you apply a penalty people begin to find the practical value of the law.

We now have notices of infectious diseases from nearly every small town in the State, which are sent in to the State Board of Health; but there are comparatively very few small towns where public bacteriological work is done by the local board of health. The city of Boston, the cities of Worcester, Lowell, Fall River, Springfield, and nearly all places having over twenty thousand inhabitants are now conducting their own bacteriological work, and making diphtheria cultures from their own population. It is certainly better for it to be done in the town itself than by the State Board, because the answers can go much more punctually and quickly; and physicians are always better satisfied to get them quickly than to wait one or two days, as they are obliged to when they send them one hundred and fifty miles even, and do not get them perhaps until thirty-six hours after the taking of the cultures.

There is one point I have often thought of; that is, how many people exist in the State with diphtheria bacilli in their throats and are not aware of their presence, nor suffer with actual illness. You go into a family where there is diphtheria, you find the children very ill, and find the bacilli very abundant. You examine other members of the family who are apparently well, but you find the bacilli in their throats also. They got them from the sick children.

Dr. Miller.— Mr. Chairman, Dr. Abbott just made the remark that this subject was very important to boards of health. It seems to me that it is of very great importance to the practitioner; and I would like to ask if the State Board of Health has power to send an officer out to examine a case of supposed diphtheria upon application of a physician out of the city. It seems to me something of that kind would be an advantage.

Dr. Abbott.— Simply as a matter of investigation, but not as a matter of executive authority or compulsory examination.

Dr. Miller.— In many towns there is no elected board of health; but the selectmen by virtue of their office, if no board of health is elected, serve as a board of health. Sometimes the chairman of that board, as the only qualification that he has for the office, has an extremely large bump of self-esteem; and it is often very annoying to the practitioner in cases of that kind. My observation within the last two or three years has been that a great many cases of ton-

sillitis, more particularly tonsillitis, were said — I suppose by some outsiders who had nothing to do with the case — to be diphtheria; and, consequently, when the practitioner felt positively sure that it was not diphtheria, he was very much annoyed. Now it seems to me that it would be a good law, a very good one, to authorize the State Board of Health to send out an officer to decide all such cases. I think it would be an advantage; and, if we have not any law that meets that point, I do not know why it would not be a good thing for this organization to make an effort to have such a law passed covering the whole State. As I first said, there are a great many cases of tonsillitis that are said to be diphtheria; and particularly if the board of health, which has no medical knowledge apart from the health officer, does not like the physician, it often makes considerable trouble and considerable talk.

Dr. Buck. — Mr. Chairman, I would like to have the board emphasize the suggestion made by the speaker before the last in regard to the importance of bacteriological work being done in the town where the report is at once needed. In some of the outlying cities and towns near Boston the returns are, of course, satisfactory when they reach the locality; but in Fall River, where we have had some experience in waiting two or three days for the report, it is found advisable to employ a local bacteriologist, and, unfortunately, the state of politics was such that objection was made to the slight expense incurred by the employment of local workmen. The importance of it is apparent to every one, the importance of the immediate report; and I think, if the State Board could add the weight of their authority to that local bacteriologist, it would be a help to local boards who are desirous of carrying out the work on the ground.

Mr. Buckley. — Mr. Chairman, I would like to ask you if there is any stated time in Boston when you fumigate cases of diphtheria, or do you fumigate after you take the second negative culture?

The Chairman. — As soon as the second negative culture is reported, an officer is sent to disinfect the premises.

Mr. Buckley. — I understood that the doctor from Brookline made the remark that fumigation was not insisted on until after the fourth week. It seems to me there is a vast difference between theory and practice in these cases. There might be some mild cases of diphtheria where a poor man has a family dependent upon

him, and the man might recover perhaps within a few days, within a week or a week and a half; and it strikes me it would be hardly practicable always to wait four weeks before fumigation was indulged in, and the man to be restrained from his work and wait that length of time. I was not aware that there was any stated time anywhere. I supposed it depended on either the second negative culture or that the appearance of poison had left the system.

Dr. Chase.—Well, Mr. President, where requests are made by the attending physician, not after two or three days, but after two or three weeks have passed, if the negative culture had been obtained, the boards have never declined to have disinfection at once; but, if we have believed that one negative culture was not enough to show that there was no longer danger, we have insisted on the time limit in the case of three or four weeks.

Dr. Prescott.—Mr. Chairman, it seems to me the time limit in any case of diphtheria is hardly practicable or necessary, because some cases have been sent to the south department of the City Hospital in twelve days from the time of admission, and three negative cultures have been taken. Therefore, some cases are ready for release from isolation at the end of twelve days from the time the first positive culture is taken. I agree with Dr. Brough that a great deal of trouble might be saved if before a case is reported as diphtheria the physician should wait for a positive culture from the laboratory: but during that time he should treat the case, as far as isolation is concerned, as a case of diphtheria, limiting thereby as much as possible the danger of infection.

I would like to ask if you, or Dr. Hill, or any one, knows how many cases have been at the south department where a positive culture has been found on the third culture being taken after two negative cultures. In other words, what the necessity is for the third negative culture.

The Chairman.—Perhaps Dr. Hill has that information, and can give it to you.

Dr. Hill.—In speaking to Dr. McCollom on the subject, he said he simply required three cultures, and that no case ought to be released on less than three, but he did not say anything that would answer your question. However, in our work we have found already, out of a few cases where a third culture happened to be

taken, at least one case where the two negatives were followed by one positive, so that to have two negatives is not absolute by any means. We do not claim that at all, but simply that it is an advance on previous methods.

Dr. Prescott.— Then I would like to ask another question. How as to a case, doctor, in which two negative cultures were taken, and they were absolutely free of diphtheria, where a competent man looked upon it as diphtheria, and so pronounced it?

Dr. Hill.— I do not know that we have had many of those cases, doctor. In one case, however, this difficulty occurred. The doctor stuck to his diagnosis like a man, and said he was perfectly certain it was diphtheria. He sent culture after culture, and some of those went over to Harvard, and were found negative there also; but he got another man, perhaps more expert than himself, to take a culture, and it came positive at once, and ran positive after that for some weeks. The fact was the doctor's first negatives were futile endeavors on his part.

Dr. Prescott.— Why I asked that question was, I know cases in which the clinical diagnoses of diphtheria have been sent to the south department, and the clinical diagnosis there was diphtheria. The cultures taken at the south department, which, I suppose, were taken without any technical errors, were never positive, never got a positive culture. The case goes down, though, as a case of diphtheria; and I wanted to know if there were any rule of the board of health which would cover that point.

The Chairman.— When a physician reports a case of diphtheria, that is at once regarded as *prima facie* evidence that it is diphtheria; and it is so put down on the books. That may be followed by a culture which is negative, or a dozen negative cultures. If the physician still persists that the appearance warrants him in calling it diphtheria, the board of health must receive those reports as official, and minute it as an official case of diphtheria. The board of health can stand that sort of thing just as long as the family and attending physician can.

Dr. Prescott.— I do not think that answers the question. I should not think it was a case of official diphtheria. I should think it was a case of physician's diphtheria.

The Chairman.— This law requires that, when a physician finds

a case of diphtheria or other case of infectious disease, he shall report it to the board of health. He is under a threat of penalty unless he does it; and, when he does it, the board of health is obliged to regard it as a case of diphtheria. When the attending physician is ready to release his patient and we find two negative cultures, we disinfect and discharge the patient. If in spite of the bacteriological test the attending physician persists that it is a case of diphtheria, we wait.

DR. PRESCOTT.— Then I will put the question in another way. If he gets two negative cultures and says it is not diphtheria, will the place be fumigated, although there is no clinical diphtheria?

THE CHAIRMAN.— We go and disinfect at their request.

DR. PRESCOTT.— Then if he gets two,— I am asking simply for information,— then if the physician gets two negatives cultures from the board of health, he can send a request to the board of health to have the place fumigated and the patient released from isolation?

THE CHAIRMAN.— We go at once and offer to disinfect as soon as that second negative comes in; but, if on arriving there we find that they persist that it is diphtheria from any appearances whatever, we should retire, and allow them to have diphtheria the rest of the year in isolation.

DR. PRESCOTT.— But suppose they do not want it? Nobody wants diphtheria.

THE CHAIRMAN.— But we are presuming that they do want it, by the official statement.

DR. MILLER.— Mr. President, I would like to ask about what proportion of cases (of course there are some) of supposed diphtheria prove not to be, when cultures are taken. There must be some proportion. That is, it is often the case, particularly in the country,— and I presume you have some in the city,— that a physician thinks he has got a case of diphtheria, when the culture proves that it is not. Now can you give us any idea of the proportion of those cases of supposed diphtheria that are not diphtheria?

THE CHAIRMAN.— I do not think it would be possible for me to state what that proportion is, but we are aware of the fact that a considerable percentage of the cases reported as diphtheria do not turn out to be such.

DR. BROUGH.— By looking hurriedly over the report of cases,

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those that were reported by physicians as clinical diphtheria and those sent up to the City Hospital, I have made a rough comparison between clinical and bacteriological diagnoses. In the month of January of this year there were some 201 cases of diphtheria reported, and I think perhaps 70 of those went to the hospital or were investigated bacteriologically by the board of health. Out of those 9 proved to be "not diphtheria." During the month of February there were 141 cases reported, and I think some 44 of those had cultures taken; and 7 of those were proved to be not bacteriological cases, although they were reported clinically by the physician as diphtheria. In March there were 149 cases, and I think some 70 or 80 were investigated bacteriologically; and there were 5 cases which proved not to be diphtheria. In April there were 143 cases. I think some, half at least, were investigated; and 5 of these were not cases. During the month of May there were 114 cases that were reported as diphtheria clinically by the physician. Forty-seven were investigated, of which 12 proved to be, bacteriologically, not cases. During the month of June some 83 cases were reported; 40 were investigated, and 9 were not cases. During July there were some 81 cases reported, so far; and 4 of these were not cases. I think some 20 perhaps went to the hospital. That is to say, practically, 50 per cent. of the cases were investigated bacteriologically. Out of that 50 per cent., 20 per cent. proved to be not diphtheria which were clinically reported as diphtheria, but which were not bacteriologically. I have no statistics further. But in 1895, when 4,000 cases were reported to the city, there were perhaps about 40 per cent. of those which were never proved to be bacteriological diphtheria; and it is nearly the same in subsequent years, but the bacteriological cases were very much smaller in number than those reported clinically. And of those cases reported clinically, when the number of cases came to be investigated, it was found that perhaps anywhere from 15, 20, or 25 per cent. were not really diphtheria.

Mr. Newcomb.— Mr. Chairman, in regard to this culture question, there is one point we meet in Salem; and it may be proper to introduce it. Sometimes the answer is returned to us, "No growth"; and I would like to ask either you or Dr. Hill what "no growth" means.

Dr. Hill.— "No growth" cannot be regarded as a negative cult-

ure, because "no growth" usually means simply that either the serum becomes too dry for anything to grow on it or bacilli of some kind have got in, which have spoilt the serum. It is not really logical to say "no growth" in any case, although it covers the case very well, because there often is a growth; but at the same time the value of the serum is destroyed, and therefore it is impossible to make a satisfactory examination. That is what is really meant by "no growth." Of course, it is not said whether the thing is negative or positive. It simply leaves the question open, and will never be accepted as a negative culture. Serum from the most healthy throat will almost always yield a growth of something,— bacteria, fungi, etc.

I wish to say to Dr. Prescott (I think his question has reference to two negatives being obtained during an attack of diphtheria, if I understood his question, what would then be done with the case?) we require two cultures negative "after the membrane has disappeared." So his objection could never take form, I think, if I understand him rightly.

Dr. Prescott.— Will not take form! Should not take form, perhaps; but it has taken form in a great many cases in Boston, and a former city physician was very positive in his statements that no case should be reported as diphtheria without a positive culture, and that was the reason that I wished to know what the board of health's opinion was at the present time. It seems to me that there are certain cases in which no positive culture is ever obtained, but in which the disease, as far as the most competent men can make them, or men who have had many cases of diphtheria, is judged to be diphtheria, and the men who in their bacteriological work have looked upon diphtheria as simply the presence of K. L., as they are called, in the throat, and, when they get clinical experience, look upon it as the presence of membrane in the throat. It seems to me the board of health should have some definition as to what is diphtheria, and that is the reason I asked the question.

The Chairman.— I should like to answer that question, of which I did not catch the drift. In the first place, we are obliged to recognize, as I said before, the report of the physician as an official notice warranting us in placing it on the book as a case of diphtheria. So long as any clinical appearances remain in the throat

warranting a suspicion of diphtheria, I think we are warranted in regarding it as a case of diphtheria. When the membrane or other appearances have disappeared, I do not think we are warranted in calling it a disease, diphtheria, even though the bacilli remain, but a case dangerous to public health, and warranting our insisting upon isolation until two negatives have been received.

Dr. Shea.— Mr. President, it has happened in my experience that a child has had diphtheria and the case has been sent to the hospital. We have taken a negative culture, and it comes back to us occasionally not a case. But I think the physician should be encouraged; and I, for one, always encourage physicians to report their cases of diphtheria, if they think they are diphtheria. I think any physician in Boston that will go to the trouble of reporting a case of diphtheria always considers it as such. If the case is not one, the family, as a rule, are very quick to know it. They will either change the physician or they will ask the physician to take a culture. I think physicians of this class should be encouraged to report their cases. No harm can be done, as a rule, other than at least a disinfection, which accomplishes some good in case the patient has not diphtheria; and I think, in the great majority of cases that have been reported without any culture, no harm has been done. From the mere fact of the physician reporting that case we gain probably two days. The case is immediately isolated. Whereas, by the physician calling on the bacteriologist, he would wait two or three days; and that means that most of the injury has been already done. Immediately, when a case is reported by the physician, that case is isolated, it is investigated; and, if there is any question of the diagnosis, it is referred to the department for a culture, which sometimes is necessary. I think that is the great feature in our work. When a case is reported, we can commence to act. We can give the bacteriologist a chance and the disinfector a chance; and, if that is done, I do not think any harm is done, but a great deal of good is accomplished.

Dr. Jackson.— Mr. Chairman, the prevention of the spread of diphtheria has been discussed very fully indeed from the standpoint of bacteriology and also from the common-sense standpoint; but there is one point that has been brought very strongly to my attention. I practised medicine in one of the rural towns of Massachu-

setts, quite close to Boston, and some of the local cities surrounding Boston. It is the custom in Boston, I am quite sure, and also in these local towns and cities, to collect all the swill. Now this swill is gathered from every house; and in these houses where there have been cases of diphtheria, the children convalescent from diphtheria, there are oranges, the peel of oranges and fruit which are thrown into the garbage pail, and this is collected and deposited in one place in the city. Then it is sold to farmers. These farmers come down from the towns with their carts, and they gather this swill. They buy it for so much a cord: it is carted to their farms. On the way in transit more or less of this is jolted out of the carts, and the remainder is generally deposited near their pig-pens. My attention was first drawn to this fact five or six years ago, when I had an isolated case of diphtheria on an apparently healthy farm. The farmer had carted this swill. A domestic animal, a cat in that family, probably being hungry, had fed from the swill-pail. It had contracted diphtheria; and the child, petting this cat, contracted diphtheria from the cat. I am quite sure that animals feeding from these pails of swill will contract diphtheria. The object is, of course, prevention of diphtheria. In the discussion of this very important subject we want to begin at the first point; and, if the lawmakers of Massachusetts are going to make one law to cover diphtheria, then, on the other hand, to come round to this law, and say that the citizens shall be practically incarcerated in their own homes, so that the disease shall not be spread, I am very sure that law is at fault. I understand that the city of Boston will cremate their garbage. It is the thing, and the only thing, to do. Failing to do that, the various towns, and also the city of Boston, should be obliged to dispose of that garbage in some other way than selling it to farmers, that the farmer's child shall not contract diphtheria.

THE CHAIRMAN.— Are there any further remarks to be made upon this paper? If not, I will ask Dr. Hill to close the discussion.

DR. HILL.— All I can do is to attempt to answer some of the questions that have been asked. In regard to Dr. Abbott's question as to the number of healthy persons that have bacilli in their throats, Dr. Biggs, of New York, made a number of investigations two years ago. I have forgotten the exact figures. He found that about 1 per cent. of people in good health presented bacilli in their

throats: but at the time there was an extended epidemic of diphtheria going through the city, so that his results do not throw any great doubt upon positive diagnoses, so far as this point is concerned.

The percentage of the total cases reported which are sent in for diagnosis is a question which cannot be answered, as far as I know, from the records at the present time, because they have not been made out with that object in view; but I may say, bearing on the question to some slight extent, that, of the cases examined by us, only 22 per cent. of the new cases sent in for diagnosis proved to have diphtheria bacilli present. Of course, that does not mean that the physician expected all the other 78 per cent. to turn out diphtheria: in many cases the clinical diagnosis showed tonsillitis or something of the kind; but it simply shows that, of all the cases, only 22 per cent. of the cases were positive.

The proportion of cases considered not diphtheria by the physician, demonstrated to be diphtheria by us, it is also impossible to give at the present time; but it is probable that there is a larger proportion of cases that are demonstrated not diphtheria than cases which are shown to be diphtheria. That is, our reversals of the physician's diagnosis decide more often in favor of the patient than otherwise.

In regard to the time involved in the examination, the quickest time that a physician can get a report from us is fifteen hours. That is to say, if we get the culture at six o'clock at night, we are ready to report by nine o'clock the next morning, as a rule; and, if he rings us up on the telephone, he can get his report within fifteen hours. There is a method by which a report can be got in six hours,— that is, if a positive result is obtained, but, if it is not positive after six hours, a negative report should not be given, until the regular examination at the end of fifteen hours is also made.

In such a case one may place one's self in the position of having reported a case negative after six hours, and then nine hours later having to call up the physician and tell him it was positive, after all. This seems a reflection on the bacteriologist, although, really, it is unavoidable. I do not remember any more of the questions asked.

The meeting then adjourned.

JOURNAL OF THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH

October Meeting, 1898

SUBJECTS: Infant Mortality in Massachusetts — Advantages of Hospitals for Infectious Diseases and of Anti-toxine in Diphtheria

THE JOURNAL OF THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

The Massachusetts Association of Boards of Health was organized in Boston in March, 1890, with the following objects: the advancement of sanitary science in the Commonwealth of Massachusetts; the promotion of better organization and co-operation in the local Boards of Health; the uniform enforcement of sanitary laws and regulations; and the establishment of pleasant social relations among the members of the Association.

All persons holding appointments as members of a Board of Health in a Massachusetts city or town, the executive officers of such a local board, and the members of the State Board of Health are eligible to membership. Other persons may be elected members by vote of the Association. The annual dues are one dollar and fifty cents, and should be paid to the Treasurer, James B. Field, M.D., 329 Westford Street, Lowell, Mass.

The Association holds four regular meetings each year, the annual or January meeting always being held in Boston.

The Official Journal of the Association is a quarterly publication, containing the papers read at the meetings, together with verbatim reports of the discussions following them. No part of this matter is printed in any other periodical.

The Journal will present, from quarter to quarter, a fair and adequate picture of the progress of practical sanitary science as applied to the needs of a modern community. The various subjects which are reviewed in the quarterly meetings of the Association are treated by experts qualified to speak from daily experience in Public Health offices, who, as men of science, are careful to be scientific and comprehensive, and who, as public officers, are no less careful to speak pertinently and so as to be easily intelligible to the layman.

The Journal, in a word, appeals to all whose interests touch the questions of sanitation and hygiene,— to the architect, the school-committee-man, the manufacturer, the contractor, and, above all, to the busy practitioner who has no time for any reading but what is brief and to the point.

The subscription price of the Journal is one dollar a year, payable in advance. Single numbers, twenty-five cents. It is on sale at the Old Corner Bookstore, and at Smith & McCance's Bookstore, 57 Bromfield Street, Boston.

All communications to the Association should be addressed to the Secretary, **EDWIN FARNHAM, M.D., City Hall, Cambridge, Mass.**

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OCTOBER MEETING

OF THE

Massachusetts Association of Boards of Health.

The quarterly meeting of the Association was held at the Franklin House, Lawrence, on the afternoon of Oct. 27, 1898. Mayor Eaton, of Lawrence, was present, as the guest of the Association. In the absence of the President the meeting was called to order by Dr. S. H. Durgin, Vice-President, who said: —

Gentlemen, we are obliged to begin our meeting, if we are to get through with our work this afternoon. I am sorry to call you from pleasure to business. We have submitted for new membership the following names, which have been approved and recommended by the Executive Committee: —

DR. J. F. WINCHESTER . . . . . Lawrence.
DR. FRANK W. SAWYER . . . . . Chelsea.

What is the pleasure of the Association? The Executive Committee also has submitted for its approval the name of Dr. H. G. Stetson, of Greenfield, Mass., which the committee approves. What is your pleasure?

Drs. Winchester, Sawyer, and Stetson were elected to membership.

The records of the meetings held April 28, at the Woodland Park Hotel, Auburndale, and July 28, at Gallop's Island, were read and approved.

THE CHAIRMAN.— Is there any incidental business to come before the meeting? If not, the first paper on the programme is that upon Infantile Mortality, by Dr. S. W. Abbott, Secretary of the State Board of Health of Massachusetts.

INFANT MORTALITY IN MASSACHUSETTS.

BY SAMUEL W. ABBOTT, M.D.

The most important work of local boards of health, beyond question, is the management and control of infectious and preventable diseases or causes of death. In those municipalities where this branch of sanitary work has been efficiently and thoroughly carried out, the health authorities have had the satisfaction of witnessing a very decided fall in the death-rate from infectious diseases, and a consequent saving of human life,— a saving which is worthy of commendation as much as is the heroic act of the life-saving crew which breasts the storm and rescues a shipwrecked and dying company from some unfortunate craft upon our storm-beaten New England coast. 'Tis true that the life-saving crew have imperilled their own lives; but the grand result is the same in either case,— the humanitarian result of saving human life.

That this saving of human life has actually resulted, and that, too, in a very large degree, as a consequence of the well-directed efforts of sanitary authorities, cannot admit of a reasonable doubt.

But, while these evidences of the great advantage of sanitary measures are clearly demonstrated, it still remains a fact that the general mortality of the State has not materially changed in a period of forty years or more, since, while the death-rate from certain diseases has diminished, that of others has increased in a corresponding degree. How, then, may the balance of mortality be so influenced that there may be a decided fall in the general death-rate (as has actually happened in England)?

I have carefully examined the list of diseases in which an increased death-rate has occurred in Massachusetts, and have no hesitation in stating that boards of health in our large cities will find a fruitful field of work in the study of the question of infant mortality, its causes, and the prevention of its excessive prevalence.

Another reason for encouragement in this special direction is the fact that many lives saved in infancy are saved for a long and useful life, and are, in fact, so much added wealth to the community at large. Dr. Schlossman says, "The death of every child constitutes a definite loss of national wealth." * On the other hand, energy expended in saving the lives of the aged from the inroads of disease at the later years of life only saves this class at a period when they are most likely to become a burden to the community.

Of so great importance is this subject that a recent writer says, "The future of our country depends most decidedly upon the question of the diminution of infant mortality." † The writer of these words was a Frenchman, a native of a country in which the death-rate has several times in the past ten years exceeded the birth-rate, and where special need for vigorous measures appears to be in order. If, then, there is encouragement in France for the adoption of stringent measures to prevent the decadence of national life, and consequently of national prosperity, there is also a like encouragement in our own State and a like incentive for action.

There are already communities in Massachusetts in which active sanitary work is necessary in this direction, as well as in France.

It is to this subject, therefore, that I now invite your attention. I shall present the subject under three heads.

(1) The prevalence of infant mortality in Massachusetts.

(2) Its causes and attendant conditions.

(3) Methods of prevention.

1. *Prevalence.*— The best measure of the infant mortality of a given population is that which assumes the births as a standard. It is a well-known fact that the census enumeration of infants is seriously defective; ‡ and this statement applies to nearly all countries in which census enumerations are taken, and especially in the United

* Zeitschrift f. Hygiene, vol. xxiv. (1897) p. 95.

† Dr. Barthes, Revue d'Hygiene, July, 1898, p. 646.

‡ See Mr. E. B. Elliot's paper in United States Census of 1870, Ninth Census, vol. ii. p. 517.

States. On the other hand, the enumeration of the births in Massachusetts, at least, is probably not far from correct. Hence this is much the better standard. In the following table the infant mortality of Massachusetts for a period of forty years is presented as a ratio per 1,000 births: —

TABLE I.— INFANT MORTALITY.

MASSACHUSETTS. 1856–95, FORTY YEARS.

Years.	Births in year ending June 30.	Deaths under one.	Death-rate under one per 1,000 births.	Years.	Births in year ending June 30.	Deaths under one.	Death-rate under one per 1,000 births.
1856	33,593	4,226	125.8	1876	43,340	6,700	154.6
1857	34,919	4,160	119.2	1877	41,635	6,343	152.4
1858	35,210	4,197	119.2	1878	41,622	6,189	148.7
1859	34,425	4,175	121.3	1879	41,010	5,855	142.8
1860	36,180	4,821	133.2	1880	42,420	7,190	169.5
1861	35,570	5,167	145.2	1881	44,715	7,389	165.2
1862	34,064	4,216	124.0	1882	45,280	7,445	164.4
1863	31,276	4,545	145.2	1883	45,993	7,515	163.3
1864	30,004	4,693	156.4	1884	48,666	7,735	158.9
1865	30,481	4,869	159.6	1885	48,710	7,625	156.5
1866	31,295	4,699	150.1	1886	49,214	7,848	159.5
1867	34,792	4,763	136.9	1887	52,364	8,514	162.6
1868	35,775	5,421	151.5	1888	53,770	8,870	164.9
1869	35,684	5,368	150.5	1889	56,140	9,105	162.2
1870	37,753	6,206	164.4	1890	57,823	9,625	166.5
1871	38,770	5,996	154.7	1891	60,246	10,186	169.0
1872	41,393	8,390	202.7	1892	63,969	10,649	166.5
1873	43,563	7,911	181.6	1893	66,492	10,990	165.3
1874	45,570	7,489	164.3	1894	67,574	10,899	161.3
1875	44,828	7,712	172.0	1895	66,746	10,564	158.2
Total	725,145	109,024		Total	1,037,729	167,236	
Mean	–	–	150.3	Mean	–	–	161.2

Mean of whole period 156.7

Strictly speaking, the death-rate of infants under one year is obtained by comparing the deaths of such infants occurring in a year with the mean number of infants under one living throughout a year; and "this number must lie between the annual number of births and that number diminished by the deaths under one. It would be

nearer the latter than the former number on account of the excess of deaths in the first months of life." (Dr. Farr.)

For the sake of uniformity in comparison with the statistics of other States and countries, the deaths under one, in the foregoing table, are compared with the births. The births in the first line (1856) are those which occurred between July 1, 1855, and June 30, 1856, inclusive, and so on through the table, the births in the last line being for the year ending June 30, 1895.*

The deaths under one in the same table are those of the calendar years ending Dec. 31, 1856, 1857, etc. The births in this whole period were 1,762,874; and the deaths under one year were 276,260, which is equivalent to a death-rate of 156.7 per 1,000 living births, as a mean of the whole period.

Dividing the whole time into ten and twenty year periods, the infantile death-rate of the first twenty years was 150.3 and that of the second twenty years was 161.2 per 1,000 births. The difference in the rates of the ten-year periods is much greater, chiefly on account of the disturbing effect of the epidemic years 1872 and 1873, when cholera infantum prevailed to an unusual degree. The infantile death-rates of the four ten-year periods were, respectively, 134.2, 164.2, 157.8, 163.6. By this it appears that the infantile death-rate has increased considerably when we compare the first twenty years with the last twenty, and especially when the first and last ten years are compared. If the figures for the two years 1872 and 1873 were to be omitted from the table, the infantile death-rate of the remaining eight years in the ten-year period 1866–75 would be reduced to 1565.

The death-rate of infants under one diminished with considerable uniformity during the five years (1891–95) from 169.0 per 1,000 births in 1891 to 158.2 in 1895, with an increase to 167.0 in 1896, and a decided drop to 148.1 in 1897.

Infant Mortality of Cities.— For the purpose of presenting the infant mortality of the cities of Massachusetts, a ten-year period has been selected; and, since only eleven out of the thirty-two cities embraced in this summary existed as incorporated cities at the beginning of the period under consideration, the ten years 1881–90 are selected for examination. The later ten-year period 1886–95 would

* For explanation of this method see Dr. A. Chalmer's Life Table of Glasgow.

have been selected; but, unfortunately, the presentation of the deaths by ages in the different cities in the State appears to have been abandoned in the registration reports since 1890.

In the following table the cities are arranged with reference to their comparative rank, so far as infant mortality is concerned: —

TABLE II.—INFANT MORTALITY OF MASSACHUSETTS CITIES.

TEN YEARS, 1881–90.

	Births.	Deaths, 0—1.	Infantile mortality.*	Rank, the State =100.
Fall River	18,557	4,449	239.7	149
Lowell	18,684	4,158	222.5	139
Lawrence	11,724	2,508	213.9	133
Boston	117,574	22,134	188.2	117
Salem	6,998	1,264	180.6	112
New Bedford	9,642	1,713	177.7	111
Chicopee	3,583	631	176.1	110
Cambridge	17,262	2,974	172.3	107
Holyoke	11,730	1,972	168.1	105
Chelsea	6,446	1,076	166.9	104
Springfield	10,276	1,616	157.3	98
Haverhill	5,748	903	157.1	98
Worcester	21,211	3,300	155.6	97
Marlboro	3,363	520	154.6	96
Somerville	7,894	1,311	154.3	96
Newburyport	3,137	479	152.7	95
Brockton	4,902	720	146.9	91
Pittsfield	3,563	516	144.8	90
Lynn	11,856	1,668	140.7	88
Taunton	6,571	923	140.5	87
Gloucester	5,726	795	138.8	86
Northampton	3,021	410	135.7	84
Fitchburg	4,804	645	134.3	84
Malden	4,745	633	133.4	83
Everett	1,956	258	131.9	82
Waltham	3,660	482	131.7	82
Medford	2,025	265	130.9	81
Woburn	3,771	479	127.0	79
Quincy	4,242	526	124.0	77
Beverly	1,817	216	118.9	74
North Adams	5,310	611	115.1	72
Newton	4,370	489	111.9	70
Urban	346,168	60,544	174.9	109
Rural	163,119	21,127	129.5	80
THE STATE	509,287	81,671	160.4	100

* Deaths of infants under one year per 1,000 births.

Of the first seven cities in this table, all except Boston are cities in which the cotton and woollen industries largely predominate. In the first three the tenement-house population is also unusually large.

In the twenty third report of the State Board of Health, page 836, attention was also called to the fact that the mortality from cholera infantum, which is one of the chief factors of the death-rate under one year, bears a direct relation to the ratio of married women employed away from their homes; and this ratio reaches its maximum in Fall River, where this class constitutes 3.1 per cent. of the total population.

There are also several smaller towns, not included in this list (Webster, Ware, Adams, and Millbury), in which the same class of manufactures is conducted, and which have a considerable tenement-house population, with a high rate of infant mortality.

The cities of Haverhill, Marlboro, Brockton, and Lynn, each having an infantile death-rate below that of the State at large, are all shoe manufacturing towns, in which the tenement-house population is comparatively small.

Near the bottom of the list are the cities of Malden, Everett, Medford, and Newton, in which the residential population largely predominates. The manufacturing population constitutes but a small fraction, and the infantile death-rate is much less than that of the State.

The death-rate of infants for the State at large was 160 per 1,000 births, while that of the combined urban population was 175 per 1,000 and that of the rural population was 129.

How do the foregoing figures compare with those of other populous communities and nations? The infantile death-rate differs much in different countries, since in some communities it amounts to as much as one-third of the births and in others it is not more than one-tenth. Table III. (page 140) gives the infant mortality of several foreign nations, and comprises the results of observations of several million cases of deaths in infancy.

From this table it appears that the infant mortality of Massachusetts is greater than that of Sweden, Ireland, Scotland, England, and Belgium, but less than that of the other countries named in the table, that of Bavaria being greater than our own by 78 per cent.

TABLE III.—INFANT MORTALITY IN DIFFERENT COUNTRIES.

DEATHS UNDER ONE PER 1,000 BIRTHS.*

COUNTRIES.	Years.	Infant mortality per 1,000 births.	COUNTRIES.	Years.	Infant mortality per 1,000 births.
Ireland . . .	1884–88	94	Italy	1884–91	192
Sweden . . .	1881–90	97	Prussia . . .	1886–92	207
Scotland . . .	1885–90	120	Hungary . . .	1884–97	212
England . . .	1885–91	144	Austria . . .	1886–87	246
Belgium . . .	1881–91	159	Saxony . . .	1886–92	281
France	1885–90	165	Bavaria . . .	1879–88	287
Holland . . .	1885–90	179	MASSACHUSETTS	1876–95	161

Of what causes is this infant mortality composed? Upon this point I shall present the results of observations of the five years 1892–96. During this time there occurred in Massachusetts 66,805 deaths of infants under two years of age; and of this number 54,867, or 82 per cent., were under one year old.

Let us analyze these figures more closely, with reference to their factors and the question whether any of the causes therein embraced are preventable by human agency.

Table IV. (see page 141) presents the causes of death as given in the Registration Reports for the years in question.

Of this list the deaths from diphtheria, whooping-cough, cholera infantum, and other diarrhœal diseases and violence are more or less preventable; and, in a measure, those from tubercular causes may be reckoned in the same category. These together constituted 45 per cent. of the whole number of deaths of infants under two years of age.

In the case of *diphtheria*, thanks to the efficient co-operation of local boards of health with the State Board in the matter of anti-

* Mostly from Dr. Eross's paper in Koch's *Zeitschrift*, vol. xix. (1896) p. 371.

TABLE IV.—INFANT MORTALITY.—CAUSES OF DEATH.

MASSACHUSETTS. FIVE YEARS, 1892–96.

CAUSES.		Under one year.	1–2 years.
1. Whooping-cough		942	339
2. Cholera Infantum		11,708	1,663
Diarrhœa		1,467	198
Enteritis		3,065	502
3. Diphtheria and croup		562	1,276
4. Tubercular diseases:			
Tabes Mesenterica		4,344	444
Phthisis		624	311
Hydrocephalus		1,090	563
5. Pneumonia		3,741	1,720
Bronchitis		2,826	819
6. Cephalitis		2,831	1,284
Convulsions		2,754	683
7. Heart Disease		741	42
8. Infantile diseases		843	5
Premature birth		5,064	2
Atrophy and debility		5,493	149
9. Violence		805	206
From suffocation:			
Under one	628		
One to two	9		
10. Unknown		589	57
11. All other causes		5,438	1,675
Total		54,867	11,938

toxine distribution and gratuitous culture work, the death-rate is already diminishing.

No specific mention of *whooping-cough* is made in the Statutes. It is, nevertheless, a disease dangerous to the public health, since about three hundred children die from it every year in this State. In some

communities the dangerous position is taken that this disease is not a public danger, and children are allowed to attend school while suffering with it. It would seem entirely proper to place this disease upon the list of causes for which a pupil should be excluded from school when suffering with it. I have made special reference to whooping-cough since, unlike many of the infectious diseases of children, it is most destructive among infants in the first year of life, while diphtheria and scarlet fever prove most destructive in the following years from one up to five.*

A slight reduction has also taken place in the death-rate from *tubercular* causes among infants during the past forty years, but not nearly so great as that which has occurred among adults.

The deaths from *violence* were not well classified until 1887, and it is difficult to compare present conditions with those which prevailed before that date. It is quite certain, however, that the death-rate of infants from violent causes has very considerably increased during the past half-century.

Deaths from suffocation among infants were uncommon in Massachusetts until recent years. During the five years 1892–96, 628 infants under one year old were recorded as having died from suffocation; and it is probable that the majority of these were due to overlaying in bed, and occurred in the first few days or weeks of infant life. Such deaths are of frequent occurrence in English cities, and often occur on Saturday or Sunday nights, the mother being intoxicated with liquor.

The *diarrhœal* diseases of infants contributed 18,543 deaths in the five years, or nearly 28 per cent. of the infant mortality. The death-roll from this group of diseases appears to have continued with but little cessation or reduction for the past fifty years; and it seems reasonable that the intelligent efforts of boards of health and of all sanitary organizations, whether official or non-official, may be exerted toward staying the progress of this factor of infant mortality with some degree of success.

* See Twenty-eighth Report of State Board of Health, p. 785.

II.

Let us now consider the causes and attendant conditions of infant mortality as they exist in this Commonwealth.

Natural Conditions which are not Preventable.

Sex.— The rate of mortality among infants differs in the two sexes. Male infants die in the first year of life at the rate of 1,200 boys for each 1,000 girls in equal numbers living. That is to say, the infantile death-rate of boys is 20 per cent. higher than that of girls of the same age in this State.

Temperature.— The greatest mortality among infants occurs in the hot season of the year, since the death-rate from cholera infantum, the chief factor of infant mortality, is highest in this season. The deaths from cholera infantum registered in the months of June, July, August, and September, 1895 and 1896, constituted about 93 per cent. of the whole number from that cause in those years (or 4,957 out of 5,334).

A decided and prolonged temperature above a daily mean of 70° F. for several days in succession is usually attended with increased infant mortality in all our cities. Table V. (page 144) presents the mean temperature in Eastern Massachusetts for the four months of June, July, August, and September, together with the ratio of cholera infantum to the total mortality for the same months for the seven years (1890–96), arranged in three groups of years according to the mean temperature of these months.

In this table, Group I. includes the three years in which the mean temperature of the four warm months was above the average of the whole period. Group II. includes the two years in which the mean temperature exactly coincides with the mean of the seven years, and in Group III. the mean temperature was below the average of the period. In these groups of years, cholera infantum appears to have borne a direct relation to the mean temperature; and, while the differences in the means are but slight, they afford a delicate index of the mortality, since the greatest differences are to be found between Groups II. and III. in each instance. These results are

TABLE V.—RELATION OF CHOLERA INFANTUM TO TEMPERATURE.

1890–96.

Groups of Years.	Years.	Mean temperature June, July, August, and September.	Cholera Infantum. Mean percentages of total mortality.
I.	1891, 1892, 1896	68.4°	6.02
II.	1890, 1894	67.4°	5.72
III.	1893, 1895	66.0°	5.25
Mean of seven years . . .	—	67.4°	5.71

obtained by the tabulation of 18,874 deaths from this cause which occurred in the seven years 1890–96.

Preventable Causes and Conditions.

1. *Density of Population.*— The progressive aggregation of inhabitants in cities and large towns (other things being equal) coincides with an increase in the general death-rate of these communities; but, when we analyze the factors of this general death-rate, the principal increase appears in the mortality among infants. This principle involving the effect of density of population upon the death-rate was established a half-century ago by Dr. Farr, who showed that within certain limits there was a definite relation between density and mortality. He showed, moreover, so far as age periods are concerned, that children under five years of age are the greatest sufferers from this condition.* But in Massachusetts, notwithstanding an increase in the density of population from 136 per square mile in 1855, to 300 per square mile in 1895, the general

* See Registrar-general's Fifth Report of England, p. 420; also Forty-ninth Massachusetts Registration Report, 1890, p. 285.

death-rate remained practically stationary (about 19.5 per 1,000),— a fact that may be taken to show that improved sanitary conditions have nearly counterbalanced the unfavorable influence of increasing density.

If the population of Massachusetts, by Census of 1895, be divided into two groups, an urban or densely settled and a rural or sparsely settled group, the former is found to comprise about seven-tenths of the population, or 1,719,680, living in 39 cities and large towns having over 10,000 inhabitants in each, and also having a density of about 2,000 per square mile; and the smaller group of 780,503 is scattered through 314 smaller towns, with a mean density of about 100 per square mile.

The death-rates of these two groups in 1895 were as follows: —

TABLE VI.—RELATION OF GENERAL AND INFANTILE DEATH-RATES TO DENSITY OF POPULATION.

1895.	Urban Group.		Rural Group.	
	Death-rates.	Per cent. above mean.	Death-rates.	Per cent. below mean.
General death-rate: Per 1,000 inhabitants . .	19.85	4	17.38	—9
Infant mortality: Per 1,000 births	174.9	9	129.5	—20

By the foregoing table it appears that the effect of density upon infant mortality was more than twice as great as its effect upon the general death-rate, the maximum and minimum departures or differences being in the one case 4 and 9, and in the other 9 and 20.

If we take two counties in which the urban and rural conditions are still more sharply defined, the contrast is greater still. In the counties of Hampden and Bristol there are 6 cities devoted largely to manufacturing (Springfield, Holyoke, Chicopee, Fall River, New Bedford, and Taunton), in which the population is quite densely

settled. There are also 36 smaller towns, mostly containing an agricultural population and sparsely settled. In the former, the cities, the infant mortality for the five years 1886–90 was 187.4 per 1,000 births, and in the rural population it was only 119.1 per 1,000 births.

Intemperance.— It is hardly necessary to assert that intemperance is a direct cause of infant mortality. The records of every country and every city give ample proof of the assertion. The poverty, the neglect, the cruelty, which are the inevitable result of a system of licensed saloons, are all handmaids of intemperance. Cities in which intoxicating liquors are sold freely under local option laws have a higher infant mortality than those in which license is forbidden by the popular vote. In the census year 1895 the infant mortality in the 17 cities in which licenses were granted was 174 per 1,000 births. In those cities where no licenses were permitted the infant mortality was only 122 per 1,000, or but little more than two-thirds as great. In this estimate no account is taken of those few cities in which the sentiment was divided, so that a change from license to no-license or *vice versa* took place during the year in question. The records of the societies established for the prevention of cruelty to children confirm the foregoing statements, both in this country and in England.

Poverty.— Poverty implies a limited supply of those things which tend to preserve life; namely, food, clothing, fuel, shelter, and an abundance of those necessities which make life comfortable and its preservation a matter of greater probability. When the family treasury is so diminished that the necessary food is lessened, and the supply of necessary warmth in winter becomes limited, the weaklings of the flock are the first to feel the blow, and to suffer from its effects.

The effect of poverty and wealth upon the mortality of children is shown in Dr. Billings's census volume upon the Vital Statistics of Boston and Philadelphia. In the series of maps presenting the conditions prevailing in Boston, one gives the mortality of children under five in the different wards and parts of wards in the city. Ward 9 comprises two divisions, "A" and "B." "A" is the northern part of the ward, embracing the region about Cambridge Street; and "B" is that portion which includes Beacon, Chestnut,

and Mt. Vernon Streets. The social conditions of these two districts are in strong contrast, "A" containing the poor, and "B" the wealthy class. "A" had a mortality of children under five amounting to 157.1 per 1,000 living of the same age, while "B" had a mortality of only 40.4 for the same class or but little more than one-quarter as great.

A similar result is shown by comparing the wages of the operatives in two leading industries with the infant mortality in cities where such industries are conducted. The average pay of shoemakers is from 60 to 90 per cent. larger than that of cotton and woollen operatives. The infant mortality in the three shoe manufacturing cities of Lynn, Haverhill, and Brockton, for a period of ten years, 1881–1890, was 146.1; while that of the cotton factory cities of Fall River, Lowell, and Lawrence for the same time, was 227.0 per 1,000 births.

Defective Food Supply.—The natural food of the infant is: (1) its mother's milk; (2) that of a healthy nurse; (3) that of the cow, properly prepared; (4) lastly, the numerous artificial substitutes for milk.

The readers of magazines and other periodicals are treated with pictures of children of marvellous beauty, who are said to have been reared upon the different kinds of milk substitutes. All these methods of advertising appeal to the public eye, but medical men know full well the specious character of such advertisements. If the photographs of the dead infants who crowd the graveyards could be shown, the ratio of the dead to the living among those who were fed upon milk substitutes would be found to be at least ten times as great as that of the infants who were nursed at the mother's breast.

Accurate data upon this point are not to be had in this country; but Dr. Boeckh, of Berlin, has collected a great number of valuable observations bearing upon this question. He has, for several years, kept a careful record of each infant born in Berlin, with reference to the method of feeding during the first year of life. By this means he is enabled to arrange all infants in the city in groups, so that the dead of each class can be compared with the living of the same class; and these results have been published.

The results were, briefly, as follows: * —

* International Statistical Bulletin, vol. ii., No. 2, p. 14.

Mortality per 1,000 infants under one year old: —

Among those who were fed on the mother's milk only . . .	7.4	per 1,000
Among those who were fed on the mother's milk and cow's milk,	21.4	" "
Among those who were fed on cow's milk alone	42.1	" "
Among those who were fed on milk substitutes	67.7	" "
Among those who were fed on cow's milk and milk substitutes,	125.7	" "

These figures are the result of a large number of observations (65,720 deaths), and may be considered as conclusive as to what is the best food for new-born infants.

But it is not only the quality of the food which is to blame for increased infant mortality, but also the conditions under which it is administered and the incidents to which it is subjected. Human milk is invariably fed at a uniform temperature and in a fresh condition, uncontaminated by external conditions. Cow's milk, on the contrary, and milk substitutes are fed at variable temperatures. They are too often stale or in a semi-putrid condition when administered in consequence of uncleanly methods of storage. The receptacles or bottles in which they are administered are also often unclean, the nipples and tubes attached to them being difficult to cleanse. In some cities, fortunately, the sale of bottles having long tubes has been suppressed by special ordinance. One health commissioner has claimed a large reduction in the infant mortality by the enforcement of such an ordinance and other measures of similar character.*

The Use of Opiates.— The careless and inconsiderate use of opiates among young infants is undoubtedly responsible for a portion of the loss of such infants by death. In 1888 the legislature of Massachusetts requested the State Board of Health to make an investigation with reference to the sale and use of opium; and the inquiry was intrusted to Dr. B. H. Hartwell, who made the following statement with reference to the use of opiates among infants, p. 155 (1888).

"The sale of soothing syrups and all medicines designed for the use of children, which contain opium and its preparations, should be prohibited. Whatever may be said in extenuation of its sale, without the advice of a physician, for use by adults, no one would advocate its use by the young. Especially is this so in regard to reme-

* Ordinances of the Department of Health, Buffalo, 1897, p. 47.

dies, the component parts of which are not made known to the public. If opium must be given to children, let the well-known paregoric be the form; and the minimum harm, as far as they are concerned, will be the result. It is the secret remedy which is the most popular. Many would be deterred from using a preparation known to contain opium, who would use without question a soothing syrup recommended for teething children." *

Employment of Mothers away from Home.— In his prize essay on "The Perils and Protection of Infant Life," Dr. Jones, of Liverpool, shows that the employment of mothers away from their homes has a disastrous effect upon the life of young infants. An examination of the data furnished by the Bureau of Labor Statistics of this State presents similar results, when these data are compared with the infant mortality of the different cities of the State. In Fall River, for example, the ratio of married women employed in the factories was 3.1 per cent. of the total population, the highest percentage in any city in the State; and in that city the death-rate from cholera infantum was also the highest.

I am aware that this proposition of Dr. Jones has been attacked by other writers; but, after carefully reviewing both sides of the question and comparing the statistics of our own State, I am convinced that the views of Dr. Jones are correct.

III.

What remedies can be employed to diminish the rate of mortality among infants in our State?

One class of conditions appears to be beyond the reach of human intervention. The natural condition of sex cannot be limited by human agency.

That of high temperature can best be limited by the removal of infants from the heated air of the towns to the cooler regions of the hills and mountains and the seashore. In this direction considerable good has already been accomplished by the establishment of seashore homes, harbor excursions, and similar projects which well deserve the public support.

* Report of State Board of Massachusetts, 1888, p. 155.

Poverty, neglect, and intemperance are social conditions that will only succumb to the hearty co-operation of an intelligent public opinion for the general amelioration of the condition of those classes of people among whom those conditions are prevalent.

The sale and use of opiates for the treatment of infants ought to be regulated by law. Various attempts to secure legislation with this end in view have been made in the past, but have failed in consequence of the interference and opposition of the patent medicine interest.

The Food of the Infant.— Bad feeding is, undoubtedly, the most fruitful cause of infant mortality. Hence intelligent measures intended to improve methods of infant feeding will probably result in a diminished infantile death-rate. As a general rule, the breast-fed infant survives; and but little attention is required to insure the safety of this class. A large ratio of infants are fed upon cow's milk. In many instances, this milk is unsuited for feeding infants because of its age and its want of cleanliness. This Association has devoted much attention in the past two years to the improvement of the milk supply, and herein lies a most fruitful field for improvement in the infantile death-rate. The laws in this State are sufficiently definite and protective so far as the matter of milk adulteration is concerned, but are quite inadequate so far as concerns the methods of milk production, the feeding of cows, and the sanitary condition of the dairy farms where the milk is produced.

Again, a very large part of the milk used for infant feeding in our cities comes from outside our State, and is practically beyond our control. One firm alone, which supplies Boston, receives milk from at least 1,000 dairies in New Hampshire and Maine.

Next come the numerous artificial substitutes for the mother's milk, many of them being the by-products of breweries and other establishments, which the manufacturers sell at a handsome profit. Undoubtedly, some survive under the use of artificial food; but the ignorance of the parent or nurse in preparing and administering them goes a long way toward imperilling the life of the child. Dr. Jones says upon this point: "The successful rearing of infants on artificial foods depends not only upon a sound knowledge of the kind of food suitable for infant feeding, but

also upon a practical knowledge of its preparation, of the quantity to be administered, of the intervals which ought to elapse between successive feedings; and excessive cleanliness in the most minute details is imperative for success. Artificially fed children die even yet under the most careful supervision more frequently than breast-fed children. . . . Better results are possible to-day with an increased knowledge and greater resources. Those of us who see day by day large numbers of the children of the industrial classes in hospital and at their homes cannot avoid the conclusion that the most frequent causes of the illnesses attributable to bad feeding is ignorance. Infants are fed upon 'anything that is going.' Any liquid preparation is poured into a bottle, and the child is fed thereon. The class of food-stuffs chosen is utterly inappropriate for infant feeding. This is a matter of common knowledge, and need not be further insisted upon. The children suffer and die. They are the victims of ignorance."

The French writer to whom I have already referred lays decided stress on the question of infant feeding as the one direction in which improvement is by all means most needed for the prevention of infant mortality.

How can improvement be effected in the feeding of infants? The class of population amongst whom this mortality is greatest is ignorant and slow to take up or adopt any suggestions of reform. Education must do its share of the work. Appeals to the medical profession to exert every effort to enlighten the families under their charge should be made.

I am not without a sincere hope that the great mass of published information which the medical profession and sanitary organizations have issued and distributed from time to time upon this subject in the shape of circulars has had some controlling influence in limiting the mortality of infants in general.

Another measure is by direct appeal to that sex which is most vitally interested in this subject as a humanitarian question. If the mothers in our large cities should organize with the direct object of lessening infant mortality, I have no doubt that good results would follow.

Another measure of undoubted utility is the establishment of

model dairies for the production of milk, such as have already been established in Newton, Mass., and at Providence, R.I.

The condition to which I have referred as influencing infant mortality in manufacturing cities, that of the employment of married women in the factories, may be met by legislation, and by another method,— the establishment of day nurseries, or *crèches*, where young infants may be cared for during the day and while the mother is at work. These establishments, however, should be under careful sanitary supervision, and should be subject to frequent inspection by a medical inspector.

In the extremely young infants there is an added danger in the first days and weeks of life, when extreme care is necessary in the case of puny and premature children to keep them at a fairly uniform temperature. An additional safeguard is provided in the use of the *couveuse*, or incubator, under careful watching, in order to maintain a uniform degree of heat till the weakling has acquired sufficient strength to enable it to live without the protection of this apparatus.

In conclusion, then, while very marked improvement has taken place in this State, in most directions as a result of direct sanitary work on the part of the health authorities of cities and towns, very little progress appears to have been made in limiting the death-rate of infants. That an open door in this direction presents itself to boards of health for earnest sanitary work — an opening, too, which presents an encouraging outlook — I have not the least doubt.

Beyond all question the one factor in diminishing the infantile death-rate lies in the direction of the food supply of this helpless class. Further improvement of the milk supply of our cities is still needed: the co-operation of women's sanitary associations, whose organizations should be encouraged; the intimate control by boards of health of the methods of feeding among the laboring classes; the establishment of day nurseries, or *crèches*, in manufacturing cities, under careful sanitary control; and the circulation of literature generally aimed at improvement in this line of sanitary work.

The Chairman.— A discussion upon this paper will be com menced immediately after dinner. I understand dinner is now ready, and we will proceed to that part of the programme.

After dinner the proceedings were resumed.

THE CHAIRMAN.— Gentlemen, in order to finish our programme and make a visit to the filter bed, and get such trains as are desirable for reaching home, we shall have to hurry our matters very much now. Before resuming the regular programme, I take great pleasure in introducing to you his Honor Mayor Eaton, of Lawrence.

MAYOR EATON.— It gives me very great pleasure, Mr. President and gentlemen of the Association, to welcome to our good city the members of this Association. We extend to you every liberty and privilege the place affords.

I have been pleased to look upon this body of men. Unlike most of those whom I have met in this room, you seem to be a sad set of men. I should say that you are in some way depressed. I hardly know why you should be. It may be the business in which you are engaged. There is enough in it to make any man feel discouraged and heart-sick all the time. If you do the best you can, the public find fault with you. If you do nothing, it still finds fault. If you inspect, you are blamed; and, if you do not, you are faulty. You have to go against public sentiment, override public opinion, and enforce laws against great opposition. That is what makes you sad. If you fully realized the importance of the work you are doing, it would make you more cheerful.

We boast of our public schools because they educate our children. But these boards of health not only educate the children, but also the adults, in ways just as important to the community as the rudimentary studies pursued by the scholars in our schools. How much better off we are as a people because of the boards of health in the various towns and cities of the Commonwealth! We boast of our fire department: it preserves our property. So the boards of health preserve our property. Had we continued as we were going on in this city years ago, much of our property would have become valueless: it would have been buried in rubbish. The board of health came to our relief; and, as you go through our streets to-day, you will find they are nice and clean, for which we give thanks to the board of health. We are pleased with our po-

licemen. They do us a good service: they try the doors and windows, they keep the burglars away. But the board of health comes around, and stops the unseen enemy — ten times worse than burglars — from entering through the pipes and sewers into our rooms, and destroying more in a month than burglars ever murdered in years. Gentlemen, you are doing for the community a great service. I judge of you by our own board of health. We have a novel arrangement in the city of Lawrence for disposing of our rubbish. We have a large vacant area near the Spicket River, where, when we have anything to destroy, we set it on fire. The smoke goes with the wind; and, when the people on the leeward side complain, we wait until the wind changes, then set it again, and give it to the other fellows. It does not cost us a five-cent piece, and burns up clean everything except the mattresses, some of which we are obliged to bury.

We are in constant danger all the time. The boards of health are upon the watch-tower. We have five men connected with our board. They say nothing, but they are perfect bulldogs. When they start, they get a firm hold; and they hold on until they accomplish their purpose.

Gentlemen, a word more. They are always found fault with. That is the common custom. Last spring we thought we would have inspectors look our city over; and, as we had too many policemen at that time, we detailed two, in order to give them a little exercise, to go around and examine the buildings. The board of health put them on. Those policemen labored faithfully, and did a good work. The papers at first said, "A good thing." In a few days they began to find fault, saying that we had no business to diminish the police force. Then they said we had no right to put that kind of men on. Then they wanted to have somebody appointed under the civil service. We got it all round. When you do just what the papers want you to do, they will find fault; and, when you change in accordance with their suggestion, they will still find fault. But our five men, with their teeth set, go at the work, push it through, and succeed every time.

We had in the early part of the year a great number of Syrians come upon us. They live in a strange way. You could go into

their houses at midnight: they never lock the doors. They always keep a lamp burning, well turned down. You could turn that light up, and find 2, 4, 6,— I won't say how many more,— sleeping in the same small room, with every window closed, and not a particle of ventilation. We sent these policemen round to talk with that people, to persuade them to scatter more; and the result was a change in their method of living in the city of Lawrence.

Our Board is doing much for us; and I say to it and to every other board, Keep up your courage, go ahead. The ministers of the gospel are doing much for the community; but I would just as soon be the manager of a board of health as the pastor of a large church, because one in that position can reach all classes of the people, can build them up physically, can teach them how to live decently, and can educate them for better service in this world, thus ripening them for greater enjoyment in the world to come. So I say to you all, Take courage, make up your mind what is right, go straight forward, and tell the newspapers and all the kickers to take care of themselves, and you will attend to your own business.

THE CHAIRMAN.— In expressing my own feelings, I know I represent the feelings of every person present. I wish that Mayor Eaton would join the Association, and go with us everywhere. [Applause.]

In resuming the programme, I shall have to call for a discussion upon Dr. Abbott's paper; and let me say that remarks will necessarily be brief, in order to complete the programme. Are there any remarks to be made upon Dr. Abbott's paper? It is altogether too valuable a paper to fall flat. If it should go without discussion, I should conclude that it was because the paper had been so thoroughly considered and was so good in its character that it required considerable thought in discussing it.

If there are no remarks to be made upon this paper, I will call for the next paper upon "The Advantages of Anti-toxine in Diphtheria, and of Hospitals for Infectious Diseases," by Dr. F. G. Curtis, of Newton. Dr. Curtis being detained in court, I will ask Mr. Coffey, of Worcester, to read the paper.

Mr. Coffey read Dr. Curtis's paper, which was as follows: —

ADVANTAGES OF HOSPITALS FOR INFECTIOUS DISEASES AND OF ANTI-TOXINE IN DIPHTHERIA.

BY FRANCIS GEORGE CURTIS, M.D.

Probably the majority of those who are interested in sanitary work are agreed upon two points; namely, the great advantage of hospital treatment for infectious diseases and the marked decrease in the mortality of diphtheria under the use of anti-toxine.

Since the writer's connection with the Newton Board of Health he has become an enthusiastic advocate of both of these lines of procedure; and it is with the hope that his experience may be of use to others that this paper has been written, and most of the statements made are based upon personal observation of the working of the system in Newton.

It has been our good fortune to have had an infectious disease hospital in Newton for the past seven years, the city having furnished the funds for its erection in 1890. The buildings are upon land belonging to the Newton Hospital, and are practically a part of that institution which furnishes the physicians and nurses. The first patient was admitted in March, 1891; and since that date the board has continued the policy of urging, and in some cases compelling, the removal of infectious cases to the hospital, with the gratifying result that, out of 233 cases of scarlet fever and diphtheria reported to the Board of Health in 1897, 90 were removed to the hospital.

All classes have availed themselves of the opportunity offered by the hospital, and it is not an uncommon occurrence for persons whose means are ample for affording every comfort during sickness to ask to be sent to the hospital.

The most gratifying fact of all — and it is one to which the writer refers with pride — is that in no case have the physicians offered any opposition to the wish of the board that a patient should be sent to the hospital, but, on the contrary, have always seconded the efforts of the inspector, often turning the scale in favor of removal, thus preventing the necessity of using force to accomplish the desired end.

The benefits of hospital treatment of infectious disease fall naturally into three divisions, and may be considered separately. These are the benefit to the public at large, to the family of the patient, and to the patient himself. To the public at large the chief benefit comes in the removal of the patient from a place where he is a constant menace to public health, and putting him in a hospital where he is isolated.

It can easily be seen that removal to a hospital means great protection to the public and a simplifying of the work of the board. The majority of the hospital cases naturally come from the poorer and more thickly settled sections of the community, where it is the rule for several families to occupy a single building, often using the halls and stairways in common, and where — owing to the ignorance and poverty of the people — it is almost impossible to establish an efficient quarantine.

Even among the more intelligent members of a community it is very difficult to establish an efficient quarantine, and it must be obvious to any one that the prompt removal of the patient and disinfection of the premises offer the best chance for preventing further spread of the disease.

Of the actual money cost to the community for caring for its infectious cases in a hospital, the writer can speak only in regard to the experience in his own city, and in that for the year 1897 alone, as previous to that time it was impossible to figure the expense.

In 1897 a contract was made with the trustees of the Newton Hospital, under the terms of which the city pays a fixed rate per week for each patient sent to the hospital by authority of the board; and for that year the gross cost to the city for the care of 116 cases of diphtheria, scarlet fever, and measles, was $4,213.73.

The matter of expense is always a stumbling-block, and is one reason why it is so difficult to persuade the municipality to establish an infectious disease hospital.

The average city father looks upon the health officer as a more or less harmless crank, who may be allowed to indulge in his peculiar whims in moderation, but, when he asks for money, must be sternly repressed.

It is very difficult to make the city council understand that money

spent for the erection and maintenance of an infectious disease hospital is really an economic measure, and that the removal of one patient to the hospital for a few weeks may result in checking an outbreak of disease that would be very costly, not only to the community at large, but to individuals. It is actually cheaper to send a patient to the hospital, and pay his expenses there, than it is to attempt to establish a quarantine of the premises, as may be shown by a case which occurred in Newton a few years ago.

A case of scarlet fever occurred in a family who kept a small store, and for some reason the patient was not removed to the hospital. Owing to the fact that many people were accustomed to going to the shop, it became necessary to place guards over the house to prevent the neighbors from entering it. The cost of this averaged $10 per day; and in addition it was necessary to pay for the services of a physician, and to feed the family besides, as they had no means of supporting themselves when their means of livelihood was cut off.

The expense of this one case was from $75 to $80 per week; while the highest weekly cost at the hospital has never exceeded $17, and will often be less.

An attempt was made to obtain reimbursement from the Commonwealth, as the patient was a State pauper; but the authorities refused to allow for the pay of the guards on the plea that they were employed to protect the general public, and not for the benefit of the patient. When the patient goes, or is sent, to a hospital, the Commonwealth will allow reimbursement; and in this way the net cost to the city is lessened and the best possible protection is afforded to the general public.

A few cases similar to this one will show to the city council that it is actually cheaper in dollars and cents for the city to send infectious diseases to a hospital, and it often needs some such object-lesson to accomplish the desired end.

In a small city, where there are times when only a small number of infectious cases may be present, it seems probable that the most economical manner to conduct a hospital for infectious disease is to follow the plan which obtains at Newton, and build infectious wards in connection with some private hospital, making a contract with the

hospital authorities to care for all cases sent there by authority of the Board of Health.

Where this is done, the expense is reduced to a minimum, as the city is not compelled to be at any expense in keeping the hospital ready for use when no disease exists, and yet is able to avail itself of the hospital at any moment.

At Newton, at a time like the present, when practically no infectious disease exists, the board is under no expense for maintenance; and yet, should cases occur to-morrow which ought to be removed to the hospital, a simple telephone message is all that is needed to have everything prepared for the reception of the patient in the time that it takes to have him carried to the hospital.

There are so many small hospitals in existence now that almost every city has at least one within its limits with which it can make a contract for the care of its infectious cases, or at worst it can find one within easy reach, just as the Newton Hospital takes cases from Wellesley, Weston, Watertown, and Needham.

The benefits accruing to the family of a patient by his removal to a hospital are no less obvious than those to the public at large, and are very similar. In the first place, the prompt removal of the sick person relieves the rest of the family from the danger of possible infection, and this at the earliest moment. Where there are many other children, and few rooms for isolation, this fact is of the greatest possible advantage. Instead of having the period of quarantine strung out indefinitely by successive children coming down with the disease, it is reduced to a minimum, the actual quarantine being over in twenty-four or forty-eight hours; and all that is necessary is that the other members of the family should be held under observation until the period of incubation has passed. If the other members of the family are children of the school age, this is practically reduced to having them report for the school permit after the two weeks required by the statute have elapsed.

It also makes it possible for the other children of the school age to return to school within two weeks after the removal of the sick person.

We have found this in Newton a very powerful argument to use in favor of removal, especially when there are several children who would otherwise be compelled to remain at home.

Whether it is due to the desire of the parents that their children should not lose the benefits of school, or whether — as is more likely — they prefer to be relieved of the care of the children during part of the day, at least the fact remains that they are often willing to agree to removal when they learn that the children can return to school more quickly than when the sick one remains at home.

Among the poorer classes — who, having practically nothing laid away, depend upon their daily earnings for their subsistence — it is of the greatest possible advantage to have the period of quarantine reduced to a minimum, as happens when the sick member of the family is removed.

A six weeks' quarantine for a case of scarlet fever, for instance, by preventing the well members from attending to their daily work, may reduce a family to pauperism, with all its attendant disadvantages.

It has been found in Newton that some employers will not allow their employees to continue at work when there is a case of infectious disease in the house, even though the board is satisfied that the isolation of the sick person is satisfactory enough to make it safe for the other members of the family to go at large.

Again, if the patient is removed, the family is relieved from the necessity of preparing a room in which he may be isolated and from all the numerous little details which become necessary when a case of infectious disease is treated at home. Where the family lives in a small tenement, and is limited in the number of rooms which can be used, this is a very serious problem; and one of the two things is almost sure to happen,— either the rest of the family is herded together in a few rooms, to the great detriment of their well-being, or (and this undoubtedly is what happens most frequently) the isolation of the patient is practically disregarded, and the other members of the family use the room freely, thus being exposed to infection, and, what is worse, the directions of the board in regard to the necessity of isolation and care in handling infectious disease are disregarded, and a feeling is fostered that these directions are useless, and so the power of the board is lessened.

There can be no doubt as to the advantage of hospital treatment for the sick person himself. The dark, stuffy room of the tenement

or small house is changed for the light, airy, well-ventilated hospital ward, the well-meaning but ignorant ministration of a relative or some friend who volunteers or is hired for the work gives place to the quiet, skilled care of the trained nurse, and all the latest and most approved methods of modern treatment are at the patient's command.

Naturally, the most marked change in the method of treatment is the almost universal use of anti-toxine in the treatment of diphtheria and the great reduction of the mortality especially in hospital practice, which has followed its introduction.

Wherever we look, we find the same results shown in the reduced mortality shown under the use of anti-toxine; and, in order not to multiply figures, the writer will confine his remarks to the results which have come under his own observation, simply asking you to remember that what has occurred here in a small way has occurred everywhere on a much larger scale.

The use of anti-toxine became general in Newton in the year 1895, and the first noticeable fact was a reduction of the mortality from diphtheria throughout the city from 24.69 per cent. in 1894 to 9.93 per cent. in 1895. During the year the board kept a record of the cases treated with anti-toxine and those treated by other methods, with the result that the mortality under the use of anti-toxine was 6.61 per cent. as against 16.66 per cent. in those treated by the older methods.

No account was kept of the stage of the disease at which anti-toxine was used; but all cases were included, whether the patient was moribund at the time of administration or in the earliest stages.

For three years before 1895 the average mortality from diphtheria was 29.82 per cent.; while for three years after the general use of anti-toxine it was 10.79 per cent.,— a sufficiently gratifying decrease.

Turning to the results of anti-toxine in hospital treatment, we find that they are no less marked; for in three years previous to the introduction of anti-toxine the mortality in the diphtheria wards of the Newton Hospital was 37.5 per cent., while for the three years following its use the mortality was reduced to 10.64 per cent.

One fact in regard to the use of anti-toxine has impressed itself upon the writer; namely, that it should be used at the earliest possible moment, even before the bacteriological examination has shown

the presence of K L, provided sufficient clinical evidence of the disease exists. An analysis of 189 cases at the hospital shows that there were no deaths out of 10 cases where it was injected within the first twenty-four hours: the percentage for the second twenty-four hours was 4.16 per cent., and rose steadily to 40 per cent. where it was administered after the fourth day. To any one who recalls the discomforts of the older methods, where sprays, swabbing, etc., made up the greater part of the treatment, and compares it with the present methods, the change is almost startling enough to make him an advocate of the use of anti-toxine, even were there no other advantages to recommend its use.

Of the evils following the use of anti-toxine, very few have come under our notice. In the 189 cases referred to, albumen, in appreciable amount, was noted in but 14 cases, of which 4 died. The so-called anti-toxine rash was present in a few cases, but, judging from the hospital records, was never of sufficient seriousness to warrant more than a passing notice. 2 cases developed severe arthritic symptoms, which delayed convalescence, in one case for several weeks; but both patients finally recovered.

In October of 1896 and again in the same month in 1897 severe and almost uncontrollable gastric symptoms were noticed, which in 3 cases at least ended fatally. The physicians on duty were inclined to attribute these symptoms to some peculiar property in the anti-toxine which they were using at the time, and made a change. This change was followed by a cessation of the symptoms, and there seems reason to believe that their idea of the cause was plausible.

When we come to analyze the causes of deaths, we are met with a difficulty in the fact that the hospital records are not definite; for, on looking them over, one is met with such statements as "died suddenly," "died of exhaustion," "vomited incessantly — died," etc., so that it is impossible to arrive at any definite conclusion in regard to the cause of death. Very few of the cases seem to have died of "sepsis," and those only when the patient reached the hospital after the disease was well established.

A very noticeable fact was the increase in the number of recoveries from laryngeal cases. In former times, if the patient developed laryngeal symptoms, the case almost certainly terminated fatally;

but, under the use of anti-toxine, not only are recoveries more frequent, but it is also true that laryngeal symptoms develope much less frequently.

The dose of anti-toxine which has been found most effective is from 1,500 to 2,000 anti-toxine units, according to the age of the patient. This may be repeated, if there is no marked improvement in twenty-four hours. It has seldom been found necessary to repeat the dose a third time. This experience follows very closely that of other places, and may be looked upon as the accepted course to follow in the use of anti-toxine.

In regard to the other treatment it has been found that very little is needed. The patient's strength should be kept up by proper means, and the mouth kept clean by irrigation, preferably with the normal salt solution or a solution of boracic acid. Further than this nothing is indicated, at least in the average uncomplicated case.

We have had in Newton very little experience in the use of anti-toxine for immunization, and what we have had is not such as would recommend its use for that purpose.

During one year all nurses and attendants in the diphtheria wards were given immunizing doses of from 100 to 200 units. In almost every instance a very severe anti-toxine rash developed, in one case being so marked as to compel the nurse to go off duty for two days. Of 10 persons who were immunized in this way, 2 subsequently contracted diphtheria. The final result was that immunization of the nurses has been abandoned. This experience does not agree with that of other observers, who have found immunization quite effective.

In conclusion, the result of our experience in Newton with the hospital treatment of infectious diseases, added to the general testimony as to its advantages, has been such as to lead to the hope that in the future it will be made compulsory to send all cases of such disease, without regard to the social standing of the patient, to a hospital; for in this way it is believed that a better control over the spread of infectious disease will be obtained.

THE PRESIDENT.— This paper is open for discussion.

DR. GAGE.— I would like just two minutes to call attention to what seems to me to be a real danger from these suggestions, and I

don't feel like letting it go by, if the time is late; that is, the danger to the hospital, the patients, etc. The suggestion is to use the smaller general hospitals for these contagious cases. There is but one executive management, one house officer, one matron, and one corps of nurses; and they cannot have a separate management for these contagious wards. I have seen this danger of infection become a real danger to the other patients in the hospital; and I believe that it is not wise to introduce these cases into these smaller hospitals, but to have a separate hospital.

THE CHAIRMAN.— There are several cities represented here this afternoon where there exists the hospital for contagious diseases alone. I will call upon Dr. Chase, of Brookline.

DR. CHASE.— Mr. Chairman and gentlemen, not to take up too much of your time, I have jotted down a few things that I would like to say about the Board of Health Hospital in Brookline.

The usefulness of hospitals for the isolation and care of contagious cases, in my experience, admits of no doubt whatever. I may say the same, with almost the same positiveness, of the usefulness of anti-toxine. Some of the gentlemen present visited the three isolation hospital buildings of our Board of Health when the Association met in Brookline; but, as most of those here to-day were not present there, I should like to show this photograph of one of our buildings, and briefly describe them (exhibiting a large photograph). This photograph pretty nearly represents its companion building also. One is for diphtheria, the other for scarlet fever.

At the annual town meeting of 1894 it was voted to appropriate $5,000, asked for by the board, to construct two suitable buildings for the shelter and care of persons ill with dangerous contagious diseases, and needing isolation. We already had a building for small-pox patients, which had proved very useful. Under this vote the board, after conferring with competent authorities, had constructed, in one of the least densely populated parts of the town, two buildings, a safe distance apart, and sufficiently remote from all other buildings. The special committee consisted of the chairman of the board, one of the other members, and the agent of the board. The hospitals stand on high ground near the Brookline Country

Club, in a location of great natural beauty, with plenty of space about them for the erection of tents or portable huts, in case of an extensive epidemic. Dr. Abbott, of the State Board of Health, who kindly visited the proposed location with me, said the town was to be congratulated on owning so desirable a lot of land for such a purpose. Of course, we had objections from real estate owners in the neighborhood; but the board said: "If we are going to let them tell us where the hospital ought to be located, we won't be able to build it anywhere. We will put it right here, in the first place."

The hospitals were built without haste and in a thorough manner. The chairman of the board gave a great deal of time and attention to the details of construction and equipment, and the superintendent of buildings and the sanitary inspector of the board assisted.

The buildings are of wood, single story, pavilion style, each having three small wards, with a hallway through the middle of the building, a kitchen, cellar, and attic, and can together accommodate from twenty to twenty-five patients and attendants. We assume always that most of the patients will be children. Of course, we could not accommodate that number of adults. They were planned with special attention to securing ventilation and sunlight (though not having cross-ventilation), have plastered walls covered with Windsor cement, which permit of thorough and easy cleansing; and all the rooms, including the kitchens, have open fireplaces. Speaking of the cleansing and disinfecting, we do that with formaldehyde, and also disinfect our contagious ambulance by the same means. Both buildings have modern sanitary arrangements, public water supply, and good piazzas. One of the buildings — the smaller one — is for diphtheria patients, the other for scarlet fever. At one end of the larger building are a kitchen and small ward, wholly separate, and available, when necessary, as a probationary ward for the observation of any doubtful case. This is a valuable suggestion of Dr. Walcott of the State Board. It is often very difficult to make a correct diagnosis at the outset of a case of infectious disease; and meanwhile great danger may be incurred by the family or household with whom the patient may be residing. It is, therefore, a matter of great importance to provide a place for the patient where he will not endanger others if he proves to be infectious, and at the same time

avoid the infection of the probationer, if his illness proves later to be either a non-infectious or a less dangerous infectious disease. These rooms may also prove useful at times, after disinfection, for laundry and cooking purposes, or for occupancy by convalescents before going among children, or in times of epidemic as a reserve ward. We may multiply these buildings, and have a central administration building and kitchen later on, if we require it. Both hospitals have now been occupied many times in the last four years, and have been found comfortable and convenient for patients and nurses. The hospitals can be communicated with by telephone, and are kept always ready for immediate use.

Scarlet fever and diphtheria were almost unknown in the town during the summer vacation of 1894, during which time the hospitals were building, only three cases occurring during that period; but with the opening of the schools in September both diseases, as usual, began to be more common in the town and in the neighboring cities and towns. In September there were only two new cases of scarlet fever and six of diphtheria, and October and November furnished about the same number; while in December the number of new cases of scarlet fever increased to five, and of diphtheria to thirteen, with a number of fatal cases. The board early decided on rigid enforcement of existing regulations, and also adopted a number of important new measures to prevent, if possible, an epidemic. This was just before our hospital buildings were finished. Recognizing the fact that the proper isolation of the very first cases of contagious disease in crowded tenements, like prompt action in the first five minutes of a fire, often prevents an epidemic, on October 8, when three cases of scarlet fever appeared on the first and second floors of a certain tenement, thereby exposing over twenty other children, the board with great difficulty provided for the immediate removal of the patients to a suitable vacant house, as the hospital buildings were not promised by the contractor until November 1. Four other patients were admitted to the temporary hospital before the permanent ones were ready, all going voluntarily or with the written consent of their parents, the latter, in two instances, even requesting the board to take care of their sick children in the temporary hospital in order to protect their other children. In due time all these patients were discharged well. Meanwhile in no instance did

another case appear in their tenements or houses after their removal; while by their removal the school attendance of all the other children was interrupted but a fortnight instead of till six weeks from the commencement of the last case in the house.

The new hospital buildings had been in readiness only a month when they were urgently needed for two diphtheria patients from two populous tenements. A few days later they were joined by a third patient from the first floor of still another crowded tenement in a densely populated district. This patient's little brother, too ill for transportation to the hospital, died at home of diphtheritic croup a day or two before, though having good medical attendance and being nursed by his mother. One of the diphtheria patients, after two days in the hospital, proved to have scarlet fever also, and was removed at once to the other new building, the first patient there, and was given a special nurse. This was the first and only patient in Brookline that has had to be removed to the hospital with the assistance of a constable and warrant, and was the boy whose brother died in his tenement home. Fortunately, all of the eleven hospital patients, thanks to their good accommodations and faithful and skillful nursing, made good recoveries, and established the good reputation the hospital has ever since enjoyed.

As to the use of anti-toxine, a few words. As I usually attend the patients in our Board of Health Hospital, I have had very considerable experience with anti-toxine; and upon that I base my opinion of its curative and preventive value. Just a year ago a patient who should have had anti-toxine a week earlier than when first seen by me, and who, as a forlorn hope, had an intubation and then a difficult tracheotomy performed upon her, gave me the opportunity of experiencing severe clinical and bacteriological diphtheria and testing anti-toxine in my own person. I can truthfully say that in about twelve hours after the injection of 1,000 units of Massachusetts State Board of Health anti-toxine I felt much relieved; and with the help of two devoted medical brethren, whose modesty would prevent my mentioning their names in public, I made an uninterrupted recovery.

Mr. Coffey.— Mr. President, I will say, briefly, that Worcester two years ago established a hospital for the care of infectious diseases. That hospital is — next to the one at Boston — probably the most complete hospital for the care of infectious disease in the State.

It is open the year round, in charge of a resident physician, a lady, and trained nurses who are furnished from the school of the City Hospital. The buildings are of the separate pavilion plan, diphtheria upon one side and scarlet fever upon the other, each forty feet distant from the main administration building, which is in the centre. In the rear is a separate building, making the fourth building, in which are the laundry, a chapel, and a steam sterilizing plant.

With but one exception I can give unqualified support to the paper by Dr. Curtis, as far as our experience in Worcester is concerned. We have — as perhaps many of you are aware — a great many large educational institutions in Worcester, whose pupils are from all over the country. We have frequently been able, by means of this hospital, I think, to stop the spread of contagious disease among the pupils of those institutions. We have also two large State lunatic hospitals there, in one of which we have had two outbreaks of diphtheria, in which it was confined to the persons who were first attacked, they being removed immediately to our hospital. The hospital is able to care for fifteen patients of each disease. We do not take care of measles: scarlet fever and diphtheria are the only diseases treated. We can perhaps, by a little crowding, take care of twenty of each disease. The hospital was opened for patients two years ago the twenty-fifth day of next month. The first full year, from Jan. 1 to Dec. 31, 1897, we had 92 patients. We have not at any time forced patients to go there: we have left it entirely with themselves and the physicians to decide, feeling that the hospital was so first-class and complete in every way that it would commend itself to the people generally; and thus far we have had no reason to change our opinion in relation to that matter. Most of the cases are sent there from the poorer sections, of course; but we do have patients from the very best quarters of the city, who pay their own board. In each ward there are private rooms, with fireplaces, which they can have at an increased cost. The general tax is $10 per week in the wards, and $15 and $20 per week in the private rooms, with the use, of course, of physicians. We have a visiting staff in addition to the resident physician.

Last year, in 1897, we had 92 cases treated there,— 70 cases of diphtheria and 22 cases of scarlet fever. The mortality for the entire hospital was 6.52, for diphtheria alone was 8.57. Most of the

diphtheria cases — that is, a large proportion of them — were very bad. 18 of them were intubation cases, in which we had but two deaths. The rate for intubation cases was 11.11. The number of cases of diphtheria outside the hospital was 246, with 49 deaths,— a mortality rate of 19.91. When you compare that with the rate in the hospital, and also consider the fact that the cases which we had to treat were, most of them, bad cases, many of them moribund when they were sent to the hospital, you can easily see how much better off a patient is in the hospital under treatment than he would be if left at home, even with the very best of care. A year ago I sent my own daughter, who had diphtheria, to this hospital,— she was twelve years of age,— and I was so confident that she would be well treated that I left home after she was admitted, and went to Philadelphia, to the meeting of the American Public Health Association. She was discharged cured in ten days. I cite this instance merely to show how much confidence I had myself in the hospital; and that confidence is shared, as I am proud to say, by the physicians and general public in Worcester.

The hospital is under the care and management of the board of health. It is not built in connection with the City Hospital. And there I would disagree, as Dr. Gage has done, with the recommendations and the opinions of Dr. Curtis. I don't believe that it ought to be built in connection with a general hospital, because it is almost impossible to keep the disease out of the general hospital. Our City Hospital trustees took the same view of it that we did. At a hearing held by the Finance Committee of the city council they opposed it, as we did also, with the result that the hospital was put under the immediate charge of the board of health. It is located on a hill which those of you who are familiar with Worcester will remember seeing as you go into the city. The great State lunatic hospital is located on it. Just west of that on the same hillside, with a southern exposure, is our hospital. It is a very fine location. We have sewer connections, gas and electric lighting, and a steam sterilizing plant that has no superior in the State, I think.

THE CHAIRMAN.— Will Professor Smith favor us with a few words?

PROF. THEOBALD SMITH.— Mr. Chairman, I have simply to say, to supplement the remarks of Dr. Curtis, that the immunity resulting from an immunizing dose of diphtheria anti-toxine (200–250 units) is

supposed to last only three weeks; and, when the three weeks have elapsed, another dose must be given to continue the immunity. This may account for the occurrences related in that paper.

THE CHAIRMAN.— I feel that you are all very anxious to see the notorious filter beds. Before taking the coaches I would say that his Honor the Mayor has proposed giving you a few words of description in such a way that you will all hear it at the same time,— a thing you could not do up there, and you will see what you are called upon to look at with more intelligence after the mayor's description. Is there any one who wants to offer a word upon this last paper? If not, we will ask his Honor, the Mayor, for another good speech.

MAYOR EATON.— I will try to describe in a very few words those notorious filter beds. Our filter gallery covers an area of about 2½ acres. It is longer than it is wide. Through the centre of it lengthwise extends a large drain pipe that empties into the well in the pumping station. At right angles with this large drain are many other pipes, flowing into it. These pipes are covered by stones, first about an inch and three-quarters in diameter, then another grade a little smaller, and another smaller still, until you come up to the top; and the top is covered with a thick coating of sand. The water is let in upon that sand, continually flows over it, runs through it, enters these pipes, flows into the well, is pumped into the reservoir; and we use it, and we believe it to be very pure water. That is a brief description of the notorious filter beds.

THE CHAIRMAN.— These filter beds, gentlemen, are so notorious that there is hardly any civilized country on the globe that does not recognize them as the initiative and the finest specimen of this kind of work in the whole world. Massachusetts has led in this respect, and it is due to Lawrence most that these beds have been made so perfect. I am ashamed to say that this is the first opportunity that I have personally had to see this glorious piece of work, and I think that perhaps many of you share with me the great desire to see it this afternoon. A motion to adjourn will be in order.

On motion of Mr. Coffey the Association adjourned. Then carriages were taken; and a visit to the sewage filtration beds and to the water-works was made, under the guidance of the Mayor and Board of Health of Lawrence.

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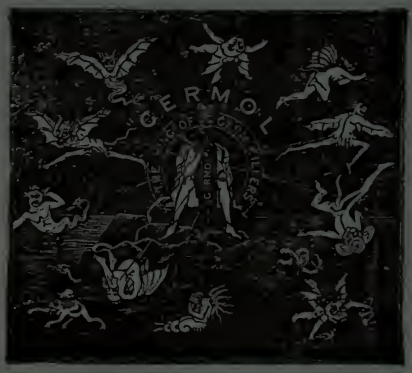

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